DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

May 16, 2007

REPLY TO
ATTENTION OF
Coastal Environment Team
Planning and Environmental Division

Mr. Gary Collins
U.S. Environmental Protection Agency
Region 4
Sam Nunn Federal Building
61 Forsyth Street, Southwest
Atlanta, Georgia 30303

Dear Mr. Collins:

Enclosed is the Section 103 Evaluation Report for the Naval Air Station (NAS) Pensacola Turning Basin at NAS Pensacola, Pensacola, Florida. We are requesting your concurrence that the maintenance dredged material is suitable for placement in the existing U.S. Environmental Protection Agency (USEPA) designated Pensacola offshore Ocean Dredged Material Disposal Site (ODMDS). The ODMDS is located in the Gulf of Mexico approximately 11 miles south of Pensacola Pass as indicated in the report.

The dredged material would be removed either by mechanical dredge and dump scow or hopper dredge and transported to the ODMDS for disposal. The material within the NAS Pensacola Turning Basin consists primarily of sand with a significant silt and clay fraction which renders unsuitable for beach placement or disposal at the USEPA designated nearshore ODMDS. A copy of the STFATE modeling results and the final chemical analysis report can be downloaded at the website ftp://eaftp.eaest.com. The username for this website is usacemobile and the password is sw2xesp8.

If you have any questions concerning this evaluation pleas contact Mr. Larry Parson at (251) 690-3139 or larry.e.parson@sam.usace.army.mil.

Sincerely,

Kenneth P. Bradley
Chief, Environment and Resources
Branch

MARINE PROTECTION RESEARCH AND SANCTUARIES ACT (MPRSA)
SECTION 103 EVALUATION

NAVAL STATION PENSACOLA TURNING BASIN
PENSACOLA BAY
ESCAMBIA COUNTY, FLORIDA

MAY 2007

1. DREDGING AND PLACEMENT PROJECT INFORMATION:

The subject of this evaluation is the maintenance dredging of the existing turning basin that provides access to the Pensacola Naval Air Station, and the subsequent placement of dredged material in the Pensacola offshore Ocean Dredged Material Disposal Site (ODMDS) (Figures 1 and 2, respectively). The Pensacola offshore ODMDS was identified as the location for the placement of material dredged from the Naval Station Pensacola turning basin because: 1) the Pensacola offshore ODMDS was designed to accept predominately fine grained material, 2) it is close to the project location, and 3) it has the capacity to accept material.

a. Dredging Locations. The proposed Naval Station Pensacola turning basin project consists of maintenance dredging of the existing turning basin that provides access to the Pensacola Naval Air Station (Figure 1). The navigation facilities serving the Naval Air Station are located in southern Pensacola Bay, just north of the Gulf Intracoastal Waterway and Perdido Key. Dredging is required for maintaining a 2,000-ft diameter turning basin to a depth of – 42 feet Mean Lower Low Water (MLLW). Dredged material will be removed along the northern edge of the turning basin (Figures 3A and 3B).

b. Core Borings Logs. No core borings were collected for submittal with the Section 103 Evaluation from the Naval Station Pensacola Turning Basin. The Naval Station Pensacola turning basin project represents maintenance dredging only. Maintenance material is represented by sediment samples collected at two locations (PNS02-02 and PNS02-05) along the northern edge of the turning basin (see Figures 3A and 3B).

c. Volume of Material to be Dredged. Based on bathymetric surveys conducted in May 2006, it is estimated that approximately 190,000 cubic yards (cy) of material will be dredged from the northern edge of the turning basin.

d. Grain Size of Dredged Material. The grain size of the dredged material varies according to sample point and depth of profile (Figure 4). Silt/clay proportions in maintenance sediments along the northern edge of the Pensacola Naval Station turning basin range from 12 percent (PNS02-05) to 47 percent (PNS02-05). Sand proportions in maintenance sediments range from 52 percent (PNS02-02) to 88 percent (PNS02-05). A detailed physical characterization for the two sampling locations along the northern edge of the Naval Station Pensacola turning basin is provided in Table 3-1.

e. Bathymetric Information. Bathymetric information for the turning basin collected in May 2006 and the area to be dredged is depicted in (Figures 3A and 3B).

f. Design Depth. The dredging area is approximately 700-ft in length and 100-ft in width. The area will be dredged to an authorized depth of –42 ft MLLW, with an additional 2-foot advance maintenance and 2-foot allowable overdredge depth.

g. Description of the Disposal Area. The Pensacola offshore ODMDS was designated by USEPA Region IV in September 1988 for fine-grained material dredged from the Pensacola area that meets the Ocean Dumping Criteria, but is not suitable for either beach nourishment or placement at the existing USEPA designated Pensacola nearshore ODMDS. The Pensacola offshore ODMDS was designated for the placement of dredged material from the Navy Homeport of Pensacola, Pensacola Harbor ship channels, and private dredging activities. The US Army Corps of Engineers and the US Navy were co-operating agencies on the site designation Environmental Impact Statement ("Final Environmental Impact Statement for the Designation of a New Ocean Dredged Material Disposal Site Pensacola, Florida, September 1988"), and as such, ensured that National Environmental Policy Act (NEPA) documentation pertaining to dredged materials from the Pensacola Federal Navigation Project and the required USACE permit were included in the document.

The existing USEPA designated Pensacola offshore ODMDS is located in the Gulf of Mexico approximately 11 miles south of Pensacola Pass (Figure 2). The Pensacola offshore ODMDS covers an area of approximately six square miles, with depths that vary from approximately 65 to 95 feet and an average depth of 76 feet.

The boundary coordinates of the Pensacola offshore ODMDS are shown in latitude/longitude and State Plane Coordinate system, Florida North Zone, North American Datum (NAD) 83:

Latitude	Longitude	Northing	Easting
30°08'50" N	87°19'30" W	428347.51	1075701.81
30°08'50" N	87°16'30" W	427959.37	1091501.16
30°07'05" N	87°16'30" W	417355.53	1091243.06
30°07'05" N	87°19'30" W	417743.77	1075439.07

A site management and monitoring plan (SMMP – July 2005) for the Pensacola offshore ODMDS has been implemented to protect the marine environment and document the disposal activities at the ODMDS. The goals of the monitoring plan include the delineation of the geographic location of the discharged dredged material; determination of the direction, if any, in which the discharged dredged material is migrating, and the extent of movement; and an evaluation of the effect, if any, on the ecology within and outside the ODMDS.

h. Expected Start, Duration and End of Dredging. The Pensacola Naval Station dredging of the turning basin is expected to commence during FY08 with dredging operations lasting approximately 2-3 months.

i. Location of Placement Within ODMDS. The dredged material will be removed via mechanical means or hopper dredge and transported to the center of the Pensacola offshore ODMDS where it shall be evenly dispersed for final disposal. The disposal site shall be surveyed before and after the project to insure proper placement of materials and compliance with ODMDS site conditions.

j. Historical Compliance with ODMDS Site Designation Conditions. The USACE or its contractors will perform before and after disposal bathymetric surveys of the designated placement area within the Pensacola offshore ODMDS. The purpose of these surveys is to delineate the geographic location of the discharged dredged material and determine the direction, if any, the discharged dredged material is migrating. These surveys will be performed periodically to ensure that navigability in the area is not impacted. Other surveys would be performed as necessary should concerns be raised concerning the placement of dredged material.

2. EXCLUSIONARY CRITERIA

a. Exclusionary Criteria. The exclusionary criteria apply to materials which meet any of the following three criteria (Part 227.13) to be considered environmentally acceptable for ocean placement without further testing:

1) The dredged material is comprised predominately of sand, gravel, rock, or any other naturally occurring bottom material with grain sizes larger than silt, and the material is found in areas of high current or wave energy.
2) Dredged material is for beach nourishment or restoration and is comprised predominately of sand, gravel, or shell with particle sizes comparable with material on the receiving beaches.
3) The material proposed for placement is substantially the same as the substrate at the proposed disposal site and the site from which the material proposed for disposal is far removed from known existing and historical sources of pollution as to provide reasonable assurance that such material has not been contaminated by such pollution.

The material proposed for dredging from the Naval Station Pensacola turning basin is not predominately comprised of sand, is not suitable or proposed for beach nourishment, and is not far removed from existing and historical sources of pollution. Therefore, the proposed dredged material from the Naval Station Pensacola turning basin does not meet the exclusionary criteria.

3. NEED FOR TESTING

a. Site History

The Pensacola Naval Station turning basin was initially dredged in 1989-1990 as part of the Navy Gulf Strategic Homeporting project. The turning basin is part of the channel infrastructure that supports a world-class naval ship pier at the Penascola Naval Air Station. This pier facility provides berthing for Naval and Coast Guard ships.

b. Locations, Quantities and Types of Pollutants Discharged Upstream of the Dredging Area. The surrounding upstream industries consist primarily of state and naval port facilities, commercial properties, and residential properties. Pollutant discharges would be consistent with those typically experienced with the incidental discharges from port activities, stormwater outfalls, and surface runoff. These discharges are regulated and would not be expected to be a significant source of pollution. No other sources of potential pollutants are known to exist within the project vicinity.

c. Dates of Previous Dredging. The Pensacola Naval Station turning basin was previously dredged in 1989-1990. Approximately 3,778,300 cy of sandy mud and silty material were dredged and placed at the Pensacola ODMDS. Sandy material from other areas of the Navy channel was placed to the west on Perdido Key.

d. Results and Dates of Previous Testing. Sediments from an area adjacent to the Pensacola Naval Air Station were sampled and tested as part of the *Final Environmental Impact Statement for Designation of a New Ocean Dredged Material Disposal Site, Pensacola, Florida*, dated September 1988. Chemical analysis of sediments and elutriates, water column and whole sediment bioassays and bioaccumulation studies were conducted during the period 1986-1988. Results indicated that the sediments exhibited minimal toxicity for both exposure to suspended particulate phases and whole sediments. In addition, no evidence of significant bioaccumulation was reported. The proposed dredged material from the vicinity of the Naval Air Station was acceptable for placement in the offshore ODMDS. Detailed results of the testing are located in Appendix D of the FEIS (USEPA 1988).

e. Locations for Previous Testing. Locations for previous testing are located in Appendix D of the FEIS (USEPA 1988).

f. Recent Events Influencing Testing Results. There are no known events that have occurred since the last sampling or dredging event that might influence the sediment chemistry or bioassay results.

4. WATER COLUMN DETERMINATIONS

Because the material proposed for dredging from the Naval Station Pensacola turning basin does not meet the exclusionary criteria and because this is the first maintenance dredging event since the basin was originally dredged, tiered testing following protocols in *The Green Book* (USEPA/USACE 1991) and the *Region IV Regional Implementation Manual* (USACE-SAD/USEPA Region IV 1993) were conducted for samples collected from the proposed dredging area in March 2002. Results of the testing and a description of the sampling and chemical testing methodologies are detailed in *Evaluation of Dredged Material from the Naval Station Pensacola Turning Basin, Escambia County, Florida* (EA 2005). A copy of the report is enclosed (hard copy and electronic version) for additional information.

Although five locations in the Naval Station Pensacola turning basin (PNS02-01, PNS02-02, PNS02-03, PNS02-04, and PNS02-05) were sampled in March 2002, results for only two of the five locations (stations PNS02-02 and PNS02-05) are referenced in this Section 103 evaluation. These stations are most representative of the material proposed for maintenance dredging along the northern side of the turning basin.

The tested material was comprised of sediment cores collected to (-46 ft MLW) and coring depths ranged from -3 to -4 feet below the sediment surface. Water targeted for chemical analysis and standard elutriate preparation was collected from one location in the central area of the Naval Station Pensacola turning basin (PNS02-04). Surficial reference sediment was collected at a Pensacola Bay reference site (PNSREF02) located east of the Pensacola Bay Bridge (Figure 1). Sediments at the reference site were comprised of approximately 64 percent silt/clay, 34 percent sand, and 2 percent gravel.

a. Sediment Testing.

Results of the physical and chemical testing of bulk sediment from Naval Station Pensacola turning basin and comparisons to marine Sediment Quality Guidelines (SQGs) are summarized in Tables 4-1 through 4-9. Sediments were analyzed for the following target constituents:

- semivolatile organic compounds (SVOCs),
- chlorinated pesticides,
- organophosphorus pesticides,
- polychlorinated biphenyl (PCB) congeners,
- polynuclear aromatic hydrocarbons (PAHs),
- butyltins,
- metals,
- ammonia (NH_3-N),
- nitrate,
- nitrite,
- cyanide,
- total sulfide,
- total Kjeldahl nitrogen (TKN),

- acid volatile sulfides (AVS) (sediment only),
- simultaneously extracted metals (SEM),
- total organic carbon (TOC), and
- total phosphorus.

In addition, the following physical analyses were conducted:

- grain size,
- specific gravity, and
- moisture content.

Detailed results of the bulk sediment testing are provided in the *Evaluation of Dredged Material from Naval Station Pensacola Turning Basin, Escambia County, Florida* (EA 2005).

The results of the grain size analysis were previously summarized in Section 1d (Figure 4 and Table 4-1) of this evaluation. Of the 142 chemical constituents tested in the sediments, 45 were detected in the sediments along the northern edge of the Naval Station Pensacola turning basin (32 percent). Metals (Table 4-3), PAHs (Table 4-4), and PCB congeners (Table 4-5) were the most frequently detected analytes in the sediments. Many of the detected metals concentrations represent naturally occurring concentrations. None of the tested chlorinated pesticides (Table 4-6), organophosphorus pesticides (Table 4-7), SVOCs (Table 4-8), and butlytins (Table 4-9) was detected in project sediments. Forty-four (44) of the 142 tested constituents were detected in the Pensacola Bay reference site sediment (31 percent).

Comparisons of chemical concentrations in Naval Station Pensacola turning basin sediments to marine SQGs indicated that majority of the detected organic contaminants are not present in the sediment in concentrations that would be expected to adversely affect aquatic organisms. Concentrations of 4 metals (arsenic, copper, lead, and mercury) and 11 individual PAHs, and total PAHs concentrations exceeded Threshold Effects Level (TEL) values in sediments from the northern edge of the turning basin. Lead in sediment from PNS02-02 was the only compound detected at a concentration exceeding the Probable Effects Level (PEL) value. The lead concentration exceeded the PEL by a factor of 1.2.

Assessment of Sediment Quality – Utilizing Aluminum Ratio Regression Plots

Various commonly found metals were examined in relation to aluminum utilizing a ratio regression plot of a 95 percent prediction limit that was developed by the Florida Department of Environmental Protection/MacDonald Environmental Sciences Ltd. (Schropp 1990). The results of that examination are provided in Attachment I and are summarized as follows:

Arsenic

Arsenic content in the sediment at the Pensacola Naval Station turning basin ranged from 7.6 – 12.7 ppm. The arsenic-to-aluminum ratio regression plots, using a 95% prediction limit, indicated that arsenic concentrations in sediment from Naval Station Pensacola turning basin locations and the Pensacola Bay reference site were within the predicted limits.

Cadmium
Cadmium was not detected in sediments from the northern edge of the Naval Station Pensacola turning basin or from the Pensacola Bay reference site.

Copper
Copper content in the sediment at the Pensacola Naval Station turning basin ranged from 7.9 – 18.9 ppm. The copper-to-aluminum ratio regression plots, using a 95% prediction limit, indicated that the copper concentration in sediment from PNS02-02 was higher than the predicted limits.

Copper was detected in the standard elutriates for both of the sampling locations along the northern edge of the Naval Station Pensacola turning basin. The detected zinc concentration in each elutriate was below the USEPA acute and chronic saltwater quality criteria (see Table 4-13).

Chromium
Chromium content in the sediment at the Pensacola Naval Station turning basin ranged from 19.3 – 32.3 ppm. The chromium-to-aluminum ratio regression plots, using a 95% prediction limit, indicated that chromium concentrations in sediment from Naval Station Pensacola turning basin and from the Pensacola Bay reference site were within the predicted limits.

Lead
Lead content in the sediments from the northern edge of the Pensacola Naval Station turning basin ranged from 11.7 – 130 ppm. The lead-to-aluminum ration regression plots, using a 95% prediction limit, indicated that lead concentrations in sediments at both of the Naval Station Pensacola turning basin sampling locations (PNS02-02 and PNS02-05) were higher than the predicted limits. However, lead concentrations in the sediment from the Pensacola Bay reference location, PNSREF02, were also higher than the predicted limits.

Lead was not detected in any of the standard elutriates from Naval Station Pensacola turning basin locations or from the elutriate for the Pensacola Bay reference site sediments (see Table 4-13).

Nickel
Nickel content in the sediment at the Pensacola Naval Station turning basin ranged from 6.3 – 8.6 ppm. The nickel-to-aluminum ratio regression plots, using a 95% prediction limit, indicated that nickel concentrations in sediment from northern edge of the Naval Station Pensacola turning basin and the Pensacola Bay reference site were within the predicted limits.

Zinc
Zinc content in the sediments at the Pensacola Naval Station turning basin ranged from 25.3 – 120 ppm. The zinc-to-aluminum ration regression plots, using a 95% prediction limit, indicated that zinc concentrations in sediments from both of the Naval Station Pensacola turning basin sampling locations (PNS02-02 and PNS02-05) were higher than the predicted limits. Zinc concentrations at the Pensacola Bay reference site, PNSREF02, were also higher than the predicted limit.

Zinc was detected in the standard elutriates for two Naval Station Pensacola turning basin locations (PNS02-02 and PNS02-05). The detected zinc concentration in each elutriate was below the USEPA acute and chronic saltwater quality criteria (see Table 4-13).

a. Theoretical Bioaccumulation Potential

Results of the bulk sediment analyses were used to calculate Theoretical Bioaccumulation Potential (TBP). TBP is a screening tool that provides a partial basis for selecting appropriate tissue analyses for quantification of bioaccumulation. The TBP represents the approximate equilibrium tissue concentration that would be expected if the sediment or the dredged material were the only source of contaminants. The TBP estimates the potential concentration of a neutral organic substance that would accumulate in an organism from continuous exposure to contaminated sediment (USACE-WES 1999). TBP is only determined for nonpolar organic compounds (PAHs, PCB congeners, and pesticides) and is not calculated for metals, organic acids or salts, organotins, or methyl mercury.

PAHs

Calculated TBPs and comparison to reference location values for PAHs are provided in Table 4-10. TBP values of the PAHs exceeded the reference location value in 25 of 36 cases (69 percent). Each tested PAH at location PNS02-02 exceeded reference location values and the TBP value for total PAHs (ND=0) exceeded the reference location value. Seven individual PAHs at location PNS02-05 exceeded reference location values; however the TBP value for total PAHs did not exceed the reference location value.

These results suggest some PAHs have the *potential* to bioaccumulate more in tissue exposed to sediments from the Naval Station Pensacola turning basin than in tissue exposed to sediments from the reference location. Specifically, comparative results of the TBP calculations indicate that there is the potential for a greater number of PAHs to bioaccumulate to concentrations greater than reference tissue concentrations for station PNS02-02. Based on the TBP results and the frequency of detected PAHs in the sediments, PAHs were targeted for tissue analyses in the bioaccumulation studies for location PNS02-02 and the reference location (PNSREF02). These studies are detailed in Section 5 of this Section 103 Evaluation.

PCB Congeners

Calculated TBPs and comparisons to reference location values for PCB congeners are provided in Table 4-11. TBP values of the PCB congeners exceeded the reference location value in 7 of 52 cases (13 percent). TBP values for total PCBs exceeded the reference value at PNS02-02 (ND=0).

These results suggest some PCB congeners have the *potential* to bioaccumulate more in tissue exposed to sediments from the Naval Station Pensacola turning basin than in tissue exposed to sediments from the reference location. Overall, PCB congeners were detected sporadically, and the majority of congeners were detected at low concentrations (estimated between the reporting limit and the method detection limit). Based on the TBP results, PCB congeners were included as target analytes in the tissue analyses for location PNS02-02 and the reference location (PNSREF02). These studies are detailed in Section 5 of this Section 103 Evaluation.

Pesticides
Chlorinated pesticides were not detected in the sediments from PNS02-02 and PNS02-05 along the northern edge of the turning basin. Therefore, TBP is not applicable for chlorinated pesticides for this project.

b. Water Column Elutriate Testing
Standard elutriates were prepared using site location water collected from the Naval Station Pensacola turning basin (location PNS02-04, see Figure 1). Results of the elutriate chemical analyses and comparisons to USEPA saltwater acute and chronic water quality criteria for aquatic life are summarized in Tables 4-1 through 4-8. Details of the project elutriate analyses are provided in EA 2005.

Elutriate Preparation Water
Elutriate preparation water chemistry results indicated that few chemical constituents were detected in the elutriate preparation water collected from Naval Station Pensacola turning basin. Of the 145 tested constituents, eleven (8 percent) were detected at low concentrations in the elutriate preparation water. None of the tested chlorinated pesticides (Table 4-17), organophosphorus pesticides (Table 4-16), PAHs (Table 4-14), SVOCs (Table 4-18), or butyltins (Table 4-19) was detected in the elutriate preparation water. Overall, low concentrations of nitrate, TKN, cyanide, sulfide, three PCB congeners (Table 4-15) and four metals (arsenic, copper, manganese, and tin; Table 4-13) were detected in the Naval Station Pensacola turning basin elutriate preparation water. None of the constituents detected in the elutriate preparation water exceeded USEPA acute and chronic saltwater criterion.

Standard Elutriate Chemistry
Only 20 of 145 chemical constituents (14 percent) were detected in the full-strength standard elutriates from Naval Station Pensacola turning basin. The majority of metals that were detected in elutriate were present at background level concentrations and were also detected in the elutriate preparation water.

Comparisons to the saltwater quality criteria indicated that NH_3-N exceeded the USEPA chronic criterion (1.4 mg/L) for station PNS02-02. A maximum 2-fold dilution of the full strength elutriate would be required to comply with the chronic water quality criterion within 1 hour following placement. None of the detected chemical constituents in the elutriate from station PNS02-05 exceeded applicable USEPA acute and chronic saltwater quality criterion.

STFATE Modeling and LPC Compliance
Results of the STFATE modeling are provided in Attachments II (PNS02-02) and III (PNS02-05). For sediments from area PNS02-02, the model indicated that a dilution of approximately 203-fold would occur within the first hour; this dilution exceeds the dilution required for the elutriate for PNS02-02 to meet the chronic water quality criteria for ammonia; therefore, the NH_3-N concentration detected in the elutriate for PNS02-02 meets the LPC for ocean placement at the Pensacola offshore ODMDS. For sediments from area PNS02-05, the model indicated that a dilution of 323-fold would occur within the first hour following placement. None of the

detected chemical constituents in the elutriate from station PNS02-05 exceeded applicable water quality criteria.

A 1511-fold and a 2494-fold dilution, for PNS02-02 and PNS02-05, respectively, will occur 4 hours following placement of a typical volume of 2,000 cubic yards of dredged material at the center of the site. After 4 hours following placement at the center of the site, the leading edge of the plume is estimated to travel approximately 4,880 linear feet from the placement location. Therefore, placement can occur at the center of ODMDS, and the leading edge of the plume will remain within the 6-square mile site boundary during a four-hour period following placement.

c. Water Column Bioassays

Three water column species, *Arbacia punctulata* (purple sea urchin), *Mysidopsis bahia* (opossum shrimp) and *Cyprinodon variegatus* (sheepshead minnow), were exposed to elutriates for the project sediments and reference location. The sea urchin tests measured developmental effects to embryos and the opossum shrimp and minnow tests measured effects to organism survival. Results of the water column biossays are summarized in Table 4-20. The test protocols are detailed in EA 2005.

Arbacia punctulata

Overall, *Arbacia punctulata* was the most sensitive species in the water column tests (EA 2005). For the *Arabacia punctulata* toxicity tests, the test duration was extended past 48 hours in order to achieve full control development to the pluteus stage. The tests were terminated after 67 hours of exposure. The elutriates prepared from the reference sediment (PNSREF02) and the sediment from PNS02-02 and PNS02-05 were not acutely toxic to *A. punctulata,* as evidenced by 67-hour EC50s of >100 percent elutriate and less than 10 percent difference in survival between the control and the full-strength elutriate. In addition, the elutriate preparation water was not toxic to *A. punctulata*, with 99 percent normal development in the undiluted elutriate preparation water. Each dilution water control had a minimum of 95 percent normal development.

Americamysis bahia

None of the five project elutriate samples was acutely toxic to *A. bahia*, with 96-hour LC50s of greater than 100 percent elutriate and less than a 10 percent difference in survival between the control and the full-strength (100 percent) elutriate concentration. The elutriate preparation water had 94 percent survival and was not acutely toxic to *A. bahia*. Survival in the control was 92 percent or greater in each of *A. bahia* toxicity tests.

Cyprinodon variegatus

None of the five project elutriates was acutely toxic to *C. variegatus*, with 96-hour LC50s of greater than 100 percent elutriate and a minimum of 96 percent survival in the full-strength (100 percent) elutriate concentrations. The elutriate preparation water had 100 percent survival, and was not acutely toxic to *C. variegatus*. There was a minimum of 98 percent survival in the control toxicity tests for *C. variegatus*.

STAFTE Modeling and LPC Compliance

STFATE modeling was conducted for both PNS02-02 (Attachment II) and PNS02-05 (Attachment III) using a LC50 value of 100 percent elutriate. A maximum 100-fold dilution would be required to achieve 0.01 of the LC50. The model indicated that a dilution of approximately 203-fold and 323-fold would occur within the first hour for PNS02-02 and PNS02-05, respectively. The LC50 values meet the LPC for ocean placement at the Pensacola offshore ODMDS.

A 1511-fold and a 2494-fold dilution, for PNS02-02 and PNS02-05, respectively, will occur 4 hours following placement of a typical volume of 2,000 cubic yards of dredged material at the center of the site. After 4 hours following placement at the center of the site, the leading edge of the plume is estimated to travel approximately 4,880 linear feet from the placement location. Therefore, placement can occur at the center of ODMDS, and the leading edge of the plume will remain within the 6-square mile site boundary during a four-hour period following placement.

5. BENTHIC DETERMINATIONS

a. Benthic Toxicity Evaluation

Two benthic species, *Neanthes arenaceoden*tata (marine polycheate) *and Leptocheirus plumulosus* (amphipod), were exposed to the project sediments and reference location for 10 days. The tests measured survival in the project sediments as compared to survival in the reference sediments. Results of the whole sediment biossays are summarized in Table 5-1. The test protocols are detailed in EA 2005.

Leptocheirus plumulosus

At test termination on Day 10, there was 84 percent survival in the reference sediment (PNSREF02) and 95 percent survival in the control sediment. Sediments PNS02-02 and PNS02-05 had 79 to 82 percent survival, respectively, and survival was not significantly (p=0.05) less than the reference sediment. Therefore, sediments from PNS02-02 and PNS02-05 were not acutely toxic to *L. plumulosus*.

Neanthes arenaceodentata

After 10 days of exposure, there was 96 percent survival in the reference sediment (PNSREF02) and control sediment. Sediments PNS02-02 and PNS02-05 had 88 percent and 96 percent survival, respectively, and were not significantly (p=0.05) less than the reference sediment. Therefore, sediment from PNS02-02 and PNS02-05 was not acutely toxic to *N. arenaceodentata*.

LPC Compliance

Survival data for both PNS02-02 and PNS02-5 along the northern edge of the Pensacola Naval Station turning basin meet the LPC for benthic toxicity.

b. Benthic Bioaccumulation Evaluation:

Twenty-eight day laboratory bioaccumulation studies were conducted with the project sediments and reference sediment using *Nereis virens* (marine polychaete worm) and *Macoma nasuta* (blunt-nose clam). Concentrations of contaminants of concern were measured in the tissues after the 28-day exposure period. Specifically, concentrations of metals were measured in tissues for the reference and for both PNS02-02 and PNS02-05. Concentrations of PAHs and PCB congeners were also measured in tissues for the reference and PNS02-02. The bioaccumulation exposure and chemical testing protocols are detailed in EA 2005.

Survival

Survival data from the 28-day bioaccumulation exposures with *N. virens* and *M. nasuta* are summarized in Table 5-2. Worm survival in the bioaccumulation exposures was 100 percent and clam survival ranged from 97-98 percent in Naval Station Pensacola turning basin sediments. None of the test sediments exhibited survival values for clams or worms that were statistically different than the reference (PNSREF02).

Tissue Chemistry

Detailed results of the tissue chemistry analysis are provided in EA 2005. A summary of the mean project tissue concentrations that exceeded reference tissue concentrations for worms and clams is provided in Tables 5-3 through 5-8. Uptake ratio tables that compare post-exposure tissue concentrations to pre-exposure tissue concentrations are provided in EA 2005.

Mean lipid values ranged from 0.6 to 1.94 percent of total wet body weight for the worms and 0.6 to 0.7 percent of total wet body weight for the clams.

In the worm tissue, one metal (arsenic) statistically exceeded the reference site tissue concentrations (Table 5-3). None of the tested PAHs (Table 5-5) or PCB congeners (Table 5-7) detected in the worm tissue residues exposed to the Pensacola Naval Station turning basin sediments statistically exceeded the reference site tissue concentrations. In the clam tissue, two PAHs (fluoranthene and pyrene) were statistically greater than concentrations detected at the reference location (Table 5-6). None of the tested metals (Table 5-4) or PCB congeners (Table 5-8) in the Naval Station Pensacola turning basin clam tissue statistically exceeded the reference site tissue concentrations.

USEPA Guidance Levels exist for arsenic, cadmium, chromium, lead, nickel, total PCBs, aldrin+dieldrin, chlordane, DDT+DDE+DDD, mirex, and total heptachlor (Table 5-9 (worms) and Table 5-10 (clams)). Upper 95 percent confidence levels of the mean tissue-residue concentrations for these constituents in worm and clam tissues exposed to Naval Station Pensacola turning basin sediments were compared to USEPA Guidance Levels. Results indicated that the tissue-residue concentrations for these constituents were statistically lower than the guidance levels in both the worm and the clam tissue residues.

LPC Compliance

Few contaminants of concern in organisms exposed to dredged material from Naval Station Pensacola turning basin statistically exceeded those of organisms exposed to reference sediment. One metal (arsenic) had a concentration in worms that statistically exceeded the reference

concentration; however, the concentrations were nearly equivalent to concentrations in pre-test tissues (EA 2005). Therefore, it is likely that the measured arsenic concentration represents either natural or analytical variability of concentrations within the tissue sample, rather than contaminant uptake from the sediment. Two PAHs concentrations in clam tissue statistically exceeded the reference tissue; however the Total PAHs concentration did not statistically exceed the reference location, and PAHs are not highly bioaccumulative through the aquatic food chain. None of the tissue-residue concentrations, for which USEPA Guidance Levels exist, exceeded the Guidance Levels. Therefore, the dredged material meets the LPC for bioaccumulation, and complies with the benthic criteria of Part 227.13 (c) (3).

6. NON-TESTING RELATED REGULATORY ISSUES FOR MRPSA SECTION 103 OCEAN DISPOSAL CRITERIA COMPLIANCE EVALUATION

a. Compliance with Part 227 Subpart B – Environmental Impact

The following criteria were evaluated to determine that the proposed dredged material placement would not degrade the marine environment, and that the dredged material placement would not produce and unacceptable adverse effect on human health or on the ocean for other future uses.

1) The material to be dredged from project area does not contain any of the prohibited materials listed at 227.5 including radioactive waste, material used in radiological, chemical or biological warfare, or persistent inert synthetic or natural materials that may float and thus interfere with legitimate uses of the ocean. In addition, the material has been sufficiently described to make this determination.
2) The material does not contain any of the constituents prohibited as other than trace contaminants listed at 227.6 including organohalogen compounds, mercury and mercury compounds, cadmium and cadmium compounds, oil, or known carcinogens, mutagens, or teratogens.
3) The material to be disposed in the Pensacola offshore ODMDS is composed of naturally occurring sediment to be dredged from waters of the U.S. and does not meet the definition of those materials listed at 227.7.
4) The material does not contain toxic waste as regulated under 227.8.
5) Although large quantities of dredged material are proposed for placement at the Pensacola offshore ODMDS, the site was designated with these quantities in mind and was located in an area and sized such that unacceptable impacts would not occur as described in 227.9.
6) The designation of the Pensacola offshore ODMDS took into account possible hazards to fishing, navigation, shorelines, and beaches. The material proposed for disposal at the ODMDS will be placed in such a manner as to not result in adverse impacts to the listed resources and as not to interfere with coastal navigation as described in Section 227.10.
7) The material proposed for disposal at the ODMDS is not required to be containerized as described in Section 227.11.
8) The dredged material does not contain any inert synthetic or natural material which may float or remain in suspension. Dredged material is natural sediment dredged from the waterways of the U.S. and is not considered to be solid waste as described in Section 227.12.

9) The materials to be dredged from project area were not considered to meet the exclusion criteria. Appropriate testing has been performed and is described in earlier sections of this Section 103 Evaluation. The material has been determined to be in compliance with the requirements of Section 227.6 and there would be no violation of marine water quality criteria after the allowance for mixing, and bioassays on the solid phase shows that the material can be discharged so not to exceed the LPC as described in paragraph (b) of Section 227.27.

b. Compliance with Part 227 Subpart C – Need for Ocean Disposal.
The need for ocean disposal was documented in the *Final Environmental Impact Statement* filed with the U.S. Environmental Protection Agency in September 1988.

The Navy has determined that it is in the best interest of the United States to provide a better mix of ships in its traditional ports as well as to establish new homeports for a battleship surface action group, an aircraft carrier battle group, naval reserve vessels and mine sweepers on the Gulf of Mexico coast. The Navy's Gulf Coast Strategic Homeport Project initially located twenty-seven ships at 6 homeports along the Gulf Coast including Pensacola. The FEIS for the Gulf Coast Strategic Homeport Project was filed with EPA in January 1987, and is incorporated into this evaluation by reference. Based on the Navy's need to deepen the existing channels that provide access to the Naval Air Station in Pensacola, a mid-shelf location in the Gulf of Mexico was designated to receive predominately silt-clay material resulting from the deepening project. The Pensacola offshore ODMDS was also designed to receive material from additional Federal and private projects. The final EIS completed by the Navy, for the overall Gulf Strategic Homeport Project including the Pensacola Homeport, evaluated the dredged material disposal alternatives, including land disposal. The Navy FEIS did not identify additional land sites suitable for disposal.

The USEPA-designated Pensacola (nearshore) ODMDS was eliminated from consideration for the disposal of the dredged material from the Pensacola Naval Station because the proposed dredged material does not meet the grain size criteria for use of the site. The nearshore site has been designated to receive material that is predominately sand.

The land use surrounding the project area consists primarily of commercial properties, developed industrial sites, and some residential areas. These sites are heavily developed and present no viable temporary or permanent disposal options. The only option identified to be feasible was the disposal of the material in the Pensacola offshore ODMDS. Following the guidance in the OTM (USEPA/USACE 1991), Tier II and III testing was completed by examining physical and chemical properties of the sediment sediment, water column and whole sediment bioassays, and bioaccumulation (tissue chemistry).

c. Compliance with Part 227 Subpart D – Impact of the Proposed Disposal on Aesthetic, Recreational, and Economic Values
The following factors have been considered in making the determination that the proposed disposal will not impact esthetic, recreational or economic values of the Gulf of Mexico or in the vicinity of the Pensacola offshore ODMDS. These factors are detailed in the FEIS (USEPA 1988):

1) The area has been used in the past for the disposal of dredged material and has not resulted in negative impacts to potential recreational or commercial activities. In addition, the mound configuration proposed for this disposal activity has been shown to benefit fisheries species by creating structure in an otherwise flat sea bottom.

2) Based on past use of the area and the characteristics of the material proposed for disposal no impact to water quality is to be expected. The material will be discharged from a hopper dredge with the initial point of discharge being anywhere from 16 to 20 feet below the surface of the water. No applicable water quality standards would be violated by the proposed activity.

3) The material proposed for discharge contains substantial quantities of silt, clay, and sand. The point of initial discharge is below the surface of the water and the majority of the material will be entrained into the disposal plume which is in a downward direction due to gravity. Studies indicate that any turbidity caused by placement is restricted to the immediate vicinity of the dump scow and persists for only a short period of time.

4) Pathogenic organisms are not expected to be present in the material. However, if present, they would likely be fecal coliforms which are killed by saline waters and therefore would not pose any impact to fisheries. No shellfisheries are located in the vicinity of the ODMDS.

5) No toxic chemical constituents are present in the dredged material in concentrations suspected of affecting humans either directly or indirectly through the food chain. There are no constituents in the dredged material that would impact living marine resources of any value.

d. Compliance With Part 227 Subpart E – Impact of the Proposed Dumping on Other Uses of the Ocean

The proposed disposal of dredged material in the Pensacola offshore ODMDS would have no long term impact any other uses of the ocean including, but not limited to, commercial and recreational fishing, commercial and recreational navigation, mineral exploration or development, or scientific research. Short-term impacts may occur due to the presence of the hopper dredge in the ODMDS, however this is extremely short term and all uses of the ocean with the exception of mineral exploration or development would continue to use the area between disposal events. No mineral exploration or development has been permitted for this area; therefore, no impacts would result to this use. No irreversible or irretrievable commitment of resources would result from the proposed discharge.

7. MPRSA SECTION 103 CONDITIONS

a. Requirements to Meet Ocean Disposal Criteria.

No special requirements or management options are required to meet the ocean disposal criteria. Future placement of material at the Pensacola offshore ODMDS will undergo the same testing requirements as per USPEA/USACE guidelines for ocean placement (USEPA/USACE 1991; USEPA/ USACE-SAD 1993).

b. Requirements of Site Designation Conditions.
The USACE or it's Contractors will perform before and after disposal bathymetric surveys of the designated placement area within the Pensacola offshore ODMDS. These surveys will be performed periodically to ensure that the depth restriction described above is met. Other surveys would be performed as necessary should concerns be raised concerning the placement of dredged material.

c. Requirements of the Site Monitoring and Management Plan (SMMP).
No conditions are deemed necessary to ensure that the requirements of the Site Monitoring and Management Plan are met.

8.0 REFERENCES

EA Engineering, Science, and Technology, Inc. 2005. *Evaluation of Dredged Material from the Naval Station Pensacola Turning Basin, Escambia County, Florida*. Final report to US Army Corps of Engineers, Mobile District. Mobile, AL. December.

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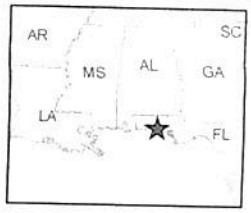
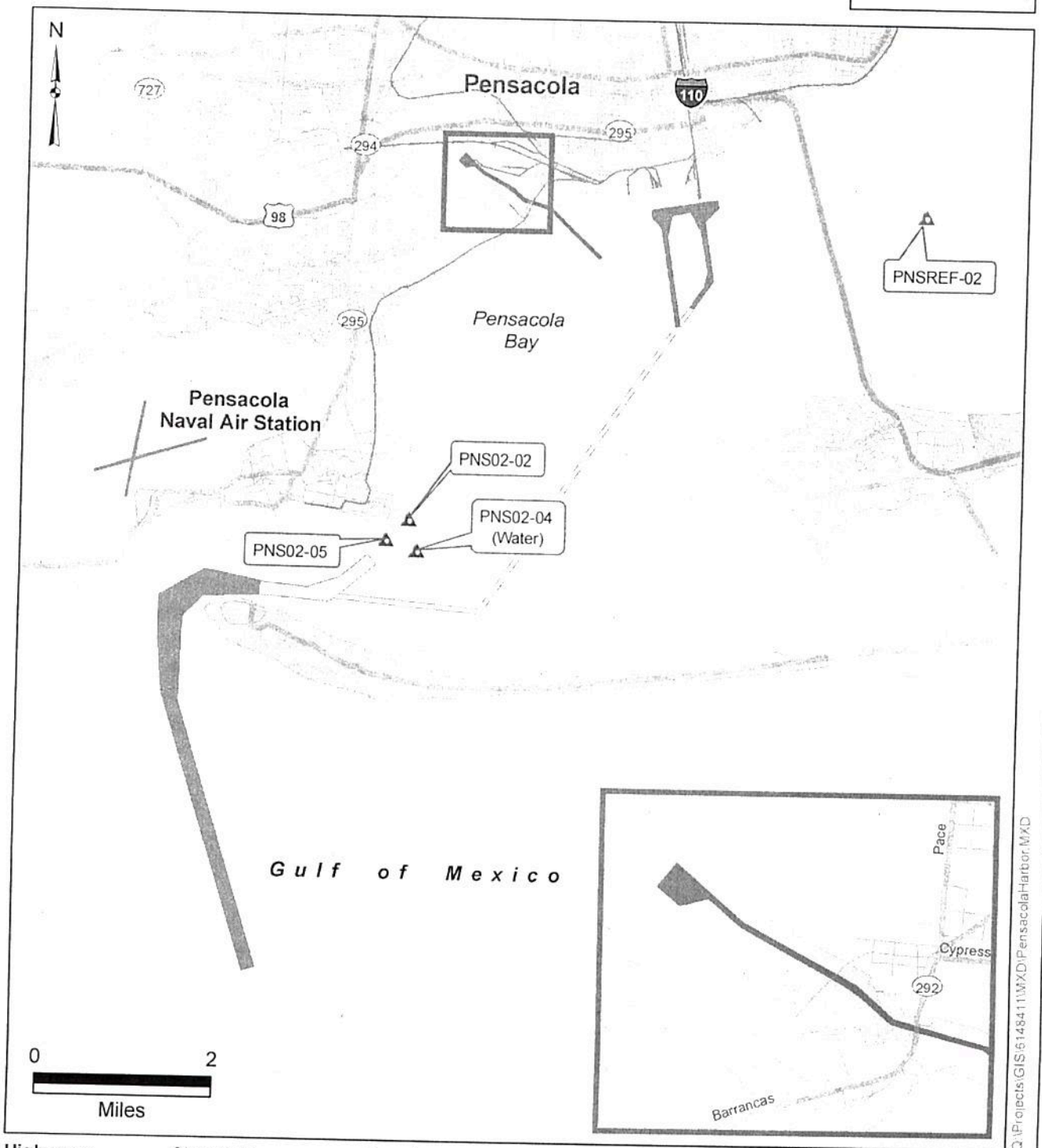
EA Engineering, Science, and Technology, Inc.

Figure 1

Naval Station Pensacola Turning Basin: Sampling and Reference Locations





Highways
- Highway
- Major Road

Hydrology
- Rivers/Streams
- Waterbody

Channels
- Bayou Chico Channel
- Barrancas Channel
- Bay Channel
- Caucus Channel
- East, West, and Inner Channel
- Pickens Channel

Samples
- Sample Location
- Reference Location

Data Sources:
ESRI, StreetMap, 2006
Coordinate System:
NAD1983SPFloridaNorth_Feet

Date:.....May, 2007
Prepared By:EA Engineering,Science, and Technology
Prepared For:.....J.M.
Contract Number:.....6148408

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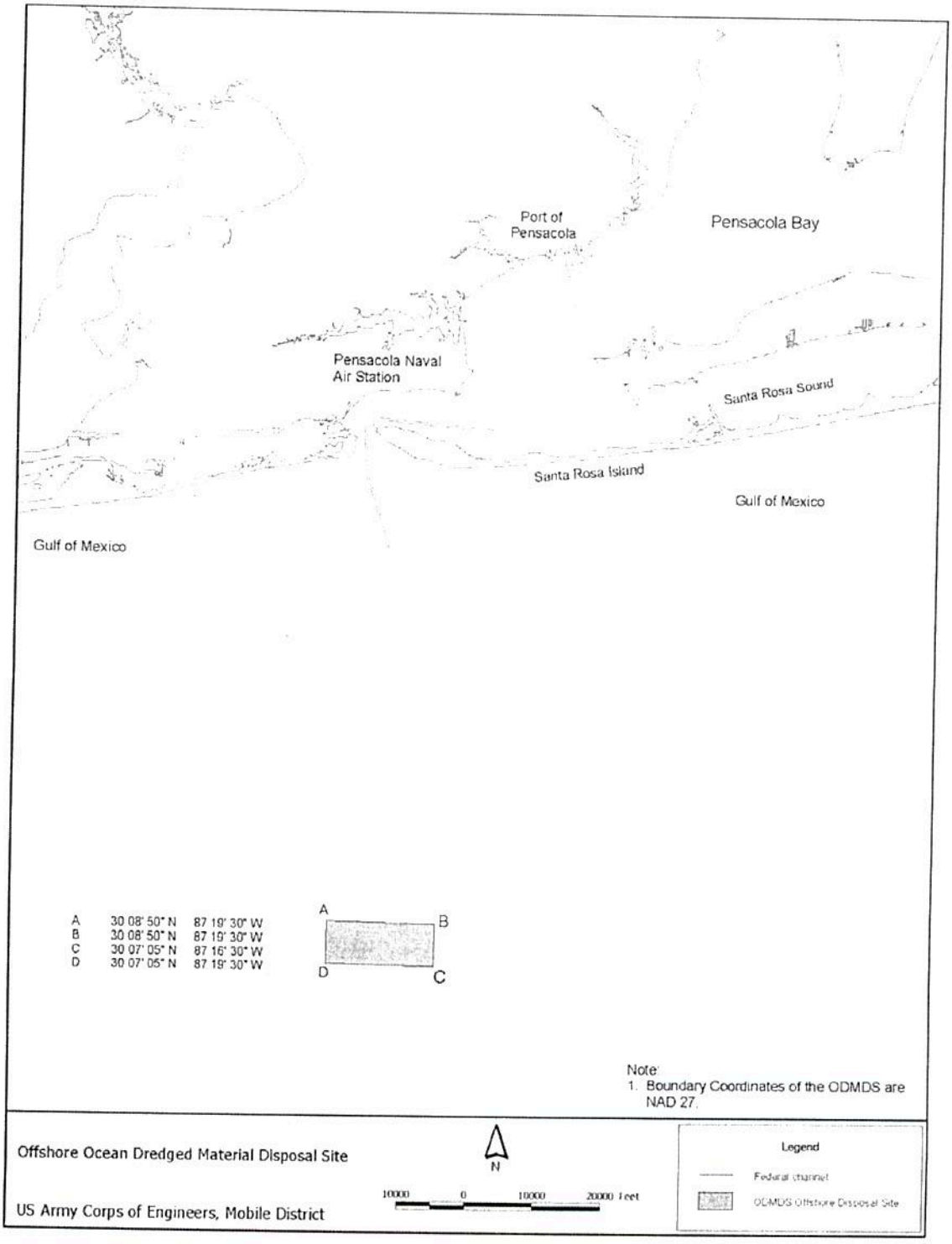
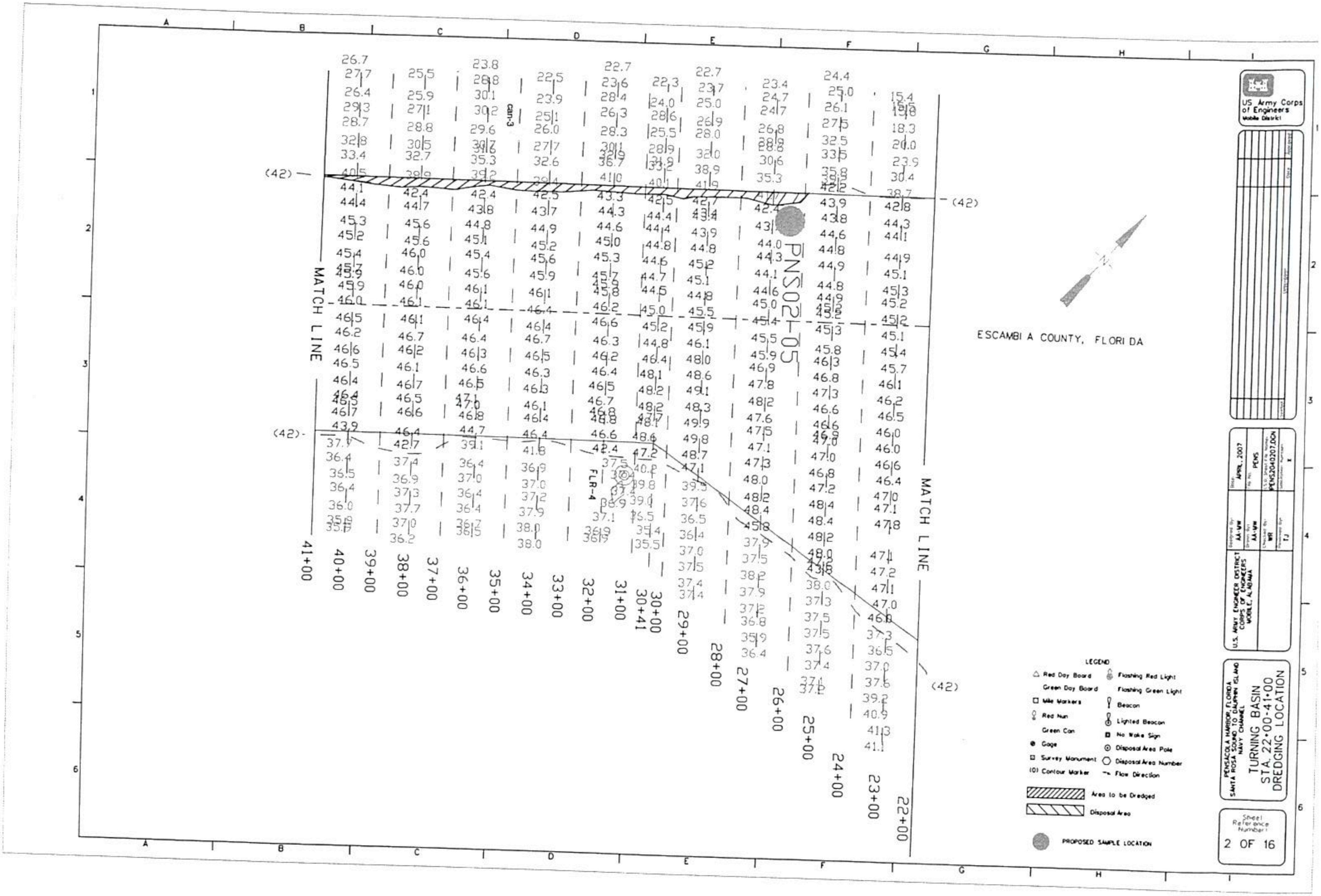


Figure 2. Offshore Ocean Dredged Material Disposal Site for Pensacola Naval Station


US Army Corps of Engineers
Mobile District
ESCAMBIA COUNTY, FLORIDA
PNS02-05
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MATCH LINE
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FLR-4
Can-3
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Red Day Board
Green Day Board
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Flashing Red Light
Flashing Green Light
Beacon
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Disposal Area Pole
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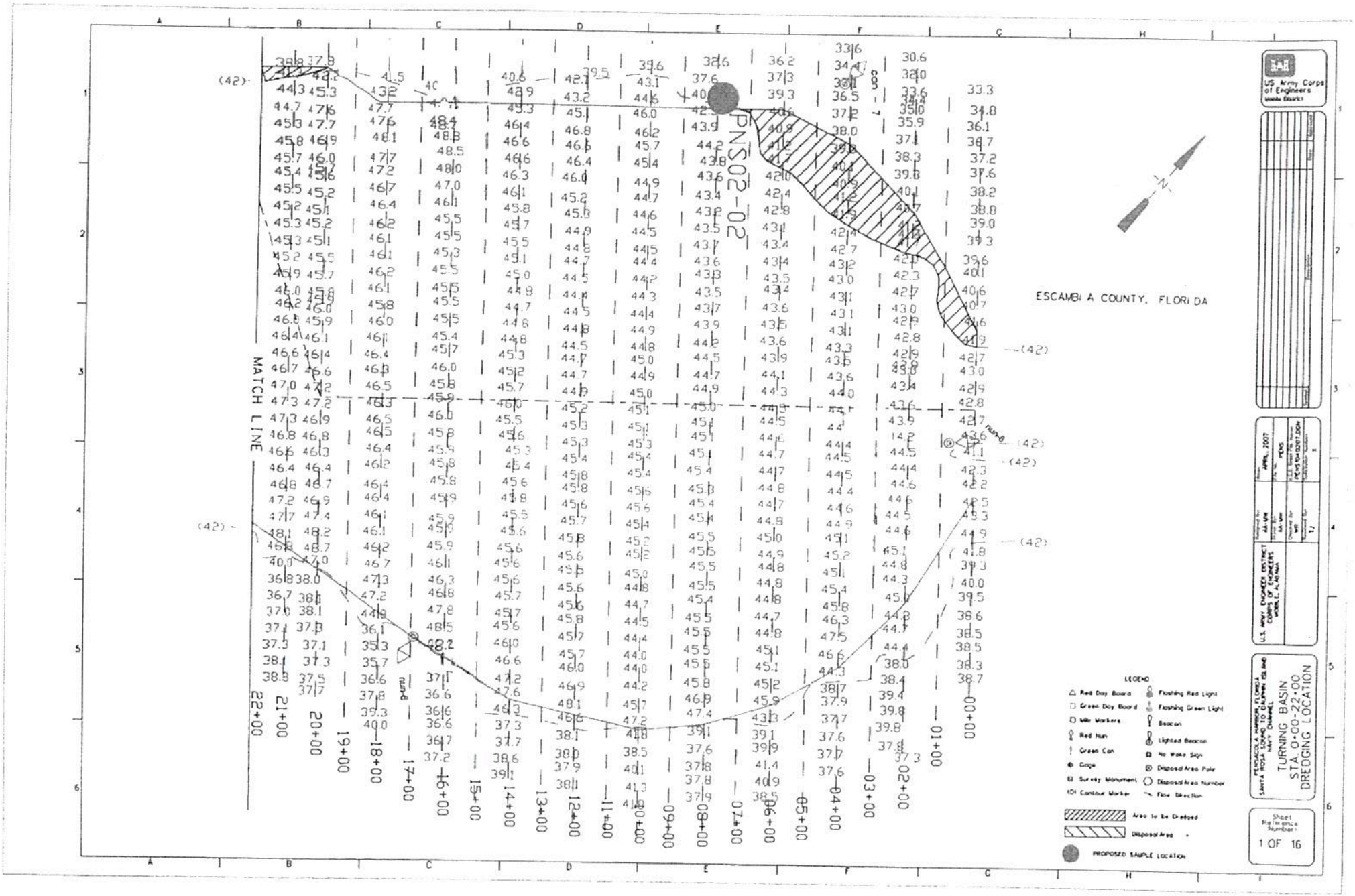
Flow Direction
Area to be Dredged
Disposal Area
PROPOSED SAMPLE LOCATION
APRIL, 2007
PENS
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
MOBILE, ALABAMA
PENSACOLA HARBOR, FLORIDA
SANTA ROSA SOUND TO DAUPHIN ISLAND
NAVY CHANNEL
TURNING BASIN
STA. 22+00-41+00
DREDGING LOCATION
Sheet Reference Number:
2 OF 16


PNS02-02
MATCH LINE
ESCAMBIA COUNTY, FLORIDA
US Army Corps of Engineers
TURNING BASIN
STA. 0+00-22+00
DREDGING LOCATION
APRIL 2007
PENSACOLA HARBOR, FLORIDA
SANTA ROSA SOUND TO CLEARWATER
NAVY CHANNEL
Sheet Reference Number
1 OF 16
LEGEND
Red Day Board
Green Day Board
Mile Markers
Red Nun
Green Can
Gage
Survey Monument
Contour Marker
Flashing Red Light
Flashing Green Light
Beacon
Lighted Beacon
No Wake Sign
Disposal Area Pole
Disposal Area Number
Flow Direction
Area to Be Dredged
Disposal Area
PROPOSED SAMPLE LOCATION

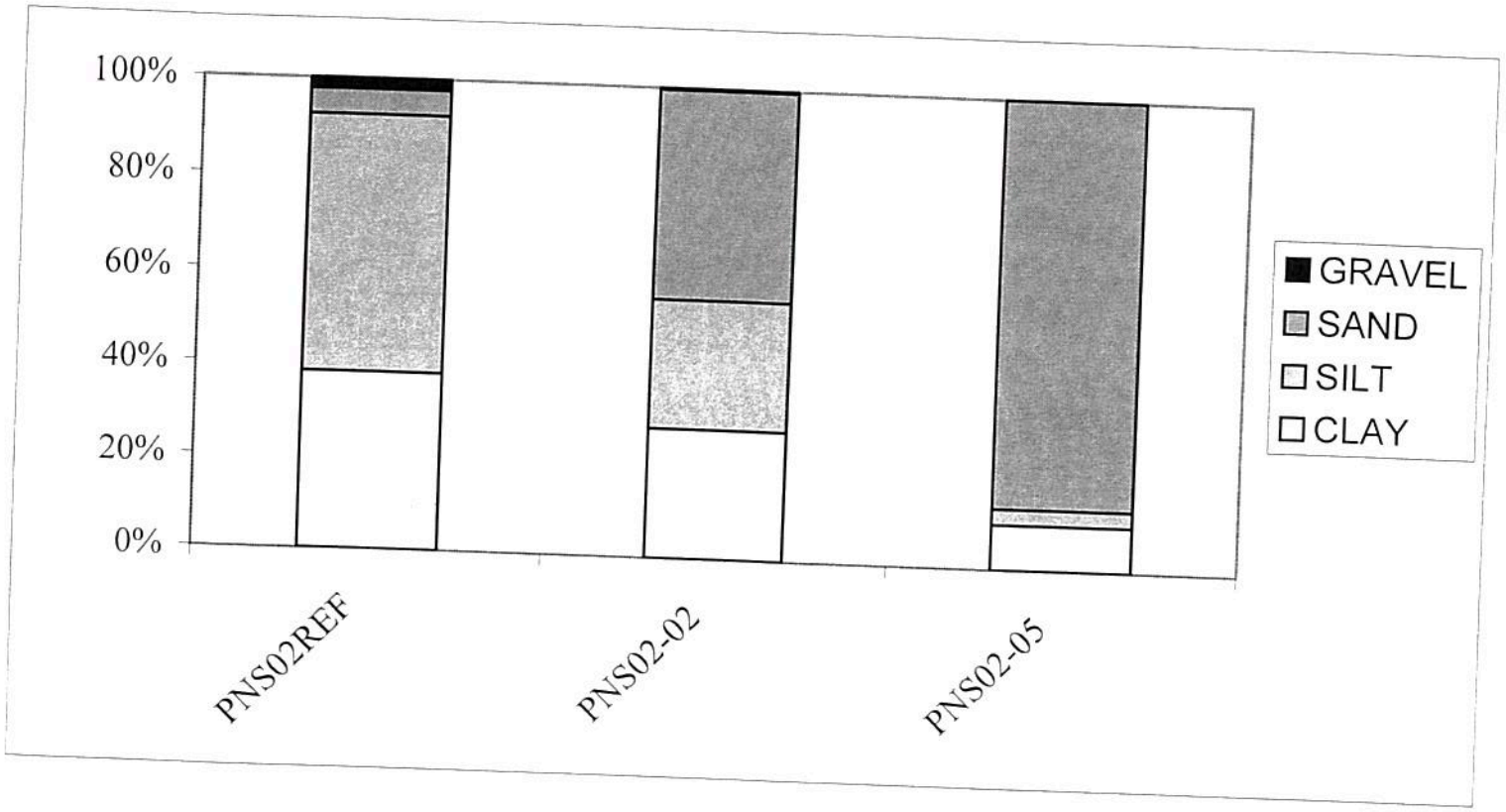


Figure 4 Grain size distribution for bulk sediments from Naval Station Pensacola Turning Basin, Florida.

TABLE 4-1 PHYSICAL CHARACTERISTICS OF SEDIMENTS FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	UNITS	MDL	PNS02REF	PNS02-02	PNS02-05
GRAVEL	%	--	2.3	0.7	0
SAND	%	--	33.6	51.9	88.1
SILT	%	--	32.4	24.3	3.3
CLAY	%	--	31.7	23.1	8.6
SILT+CLAY	%	--	64.1	47.4	11.9
% MOISTURE	%	0.1	255.5	158.7	42.9
% SOLIDS	%	--	32.5	35.3	62.1
SPECIFIC GRAVITY	G/ML	0.008	2.44	2.33	2.55

MDL = method detection limit

TABLE 4-2 NUTRIENTS AND GENERAL CHEMISTRY PARAMETERS IN SEDIMENTS FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	UNITS	MDL	PNSREF02	PNS02-02	PNS02-05
AMMONIA, as N	MG/KG	4.6	**23.7**	**145**	**43.1**
NITROGEN, NITRATE as N	MG/KG	1.2	1.5 U	1.4 U	0.81 U
NITROGEN, NITRITE as N	MG/KG	1.0	0.29 U	1.4 U	0.81 U
NITROGEN, TOTAL KJELDAHL	MG/KG	109.8	**2,370**	**1,910 J**	**912 J**
TOTAL ORGANIC CARBON	%	0.02	**3.34**	**2.24**	**1.45**
TOTAL CYANIDE	MG/KG	0.2	**0.45 B J**	**0.93 B J**	**0.34 B J**
TOTAL PHOSPHORUS	MG/KG	41.0	**53.4**	**312**	**96.1**
SULFIDE	MG/KG	8.7	**91.6**	**180**	**115**

NOTE: Shaded values represent detected concentrations.
MDL = method detection limit
B = compound was detected, but below the reporting limit (value is estimated)
J = detected in the laboratory method blank
U = compound was analyzed, but not detected

TABLE 4-3 METAL CONCENTRATIONS (MG/KG) IN SEDIMENTS FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	UNITS	TEL*	PEL*	MDL	PNSREF02	PNS02-02	PNS02-05
ALUMINUM	MG/KG	--	--	4.26	**9,550**	**10,300**	**6,770**
ANTIMONY	MG/KG	--	--	0.82	0.79 U	0.81 U	0.89 U
ARSENIC	MG/KG	7.24	41.6	0.85	**8.4**	**12.7a**	**7.6a**
BERYLLIUM	MG/KG	--	--	0.85	0.78 U	0.85 U	0.9 U
CADMIUM	MG/KG	0.676	4.21	0.17	0.16 U	0.17 U	0.18 U
CHROMIUM	MG/KG	52.3	160.4	0.85	**22.7**	**32.3**	**19.3**
COBALT	MG/KG	--	--	0.15	**3.3**	**3.4**	**2.1**
COPPER	MG/KG	18.7	108.2	0.85	**6.6**	**18.9a**	**7.9**
IRON	MG/KG	--	--	4.26	**17,300**	**19,000**	**12,100**
LEAD	MG/KG	30.24	112.18	0.85	**13.6**	**130ab**	**11.7**
MANGANESE	MG/KG	--	--	0.85	**170**	**324**	**189**
MERCURY	MG/KG	0.13	0.696	0.02	**0.05**	**0.2a**	0.04 U
NICKEL	MG/KG	15.9	42.8	0.85	**6.2**	**8.6**	**6.3**
SELENIUM	MG/KG	--	--	0.43	0.39 U	**0.48 B**	0.45 U
SILVER	MG/KG	0.73	1.77	0.09	**0.1 B**	**0.13 B**	0.09 U
THALLIUM	MG/KG	--	--	0.09	0.08 U	0.09 U	0.09 U
TIN	MG/KG	--	--	0.14	**0.76 B**	**1.1 B**	**0.58 B**
ZINC	MG/KG	124	271	0.85	**34.8**	**120**	**25.3**
SEM/AVS	--	--	--	--	0.41	0.076	0.11

**Source*: Buchman, M.F. 1999. NOAA Screening Quick Reference Table, NOAA HAZMAT Report 99-1, Seattle, WA.

NOTE: bold values represent detected concentrations; shaded and bolded values exceed sediment quality guidelines

MDL = method detection limit

TEL = threshold effects level

PEL = probable effects level

B = compound was detected, but below the reporting limit (value is estimated)

U = compound was analyzed, but not detected

a = exceeds TEL

b= exceeds PEL

NA = the AVS concentration was not detected, therefore the SEM/AVS ratio was not calculated

TABLE 4-4 PAH CONCENTRATIONS (UG/KG) IN SEDIMENTS FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	UNITS	TEL*	PEL*	MDL	PNSREF02	PNS02-02	PNS02-05
ACENAPHTHENE	UG/KG	6.71	88.9	1.4	**5.4 J**	**32a**	**1.9 J**
ACENAPHTHYLENE	UG/KG	5.87	127.87	1.3	**4.8 J**	**59a**	**1.1 J**
ANTHRACENE	UG/KG	46.85	245	1.4	**10**	**130a**	**5.1 J**
BENZ(A)ANTHRACENE	UG/KG	74.83	692.53	1.4	**44**	**400a**	**13**
BENZO(A)PYRENE	UG/KG	88.81	763.22	1.4	**58**	**460a**	**13**
BENZO(B)FLUORANTHENE	UG/KG	--	--	1.9	**91**	**400**	**12**
BENZO(K)FLUORANTHENE	UG/KG	--	--	1.7	2.6 U	**290**	**9.3**
BENZO(GHI)PERYLENE	UG/KG	--	--	1.5	**53**	**360**	**11**
CHRYSENE	UG/KG	107.77	845.98	1.4	**52**	**430a**	**15**
DIBENZ(A,H)ANTHRACENE	UG/KG	6.22	134.61	1.4	**19**	**130a**	**4.1 J**
FLUORANTHENE	UG/KG	112.82	1493.54	1.4	**82**	**940a**	**30**
FLUORENE	UG/KG	21.17	144.35	1.4	**4.1 J**	**45a**	**2 J**
INDENO(1,2,3-CD)PYRENE	UG/KG	--	--	1.5	**43**	**300**	**8.8**
1-METHYLNAPHTHALENE	UG/KG	--	--	2.9	4.4 U	**7.3 J**	1.4 U
2-METHYLNAPHTHALENE	UG/KG	20.21	201.28	1.4	2.1 U	**8.7 J**	0.71 U
NAPHTHALENE	UG/KG	34.57	390.64	1.3	2 U	**19 J**	**1.3 J**
PHENANTHRENE	UG/KG	86.68	543.53	1.4	**39**	**390a**	**17**
PYRENE	UG/KG	152.66	1397.6	2.0	**80**	**790a**	**25**
TOTAL PAHs (ND=0)	UG/KG	1684.06	16770.4	--	**585.3**	**5,191a**	**169.6**

***Source**: Buchman, M.F. 1999. NOAA Screening Quick Reference Table, NOAA HAZMAT Report 99-1, Seattle, WA

NOTE: bold values represent detected concentrations; shaded and bolded values exceed sediment quality guidelin

MDL = method detection limi

TEL = threshold effects leve

PEL = probable effects leve

J = compound was detected, but below the reporting limit (value is estimated

U = compound was analyzed, but not detecte

a = exceeds TEL

TABLE 4-5 PCB CONGENER CONCENTRATIONS (UG/KG) IN SEDIMENTS FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	UNITS	TEL**	PEL**	MDL	PNSREF02	PNS02-02	PNS02-05
BZ# 8*	UG/KG	--	--	0.135	**0.21 J PG**	**0.47 J**	0.091 U
BZ# 18*	UG/KG	--	--	0.212	0.25 U	0.25 U	0.14 U
BZ# 28*	UG/KG	--	--	0.295	0.36 U	0.34 U	0.2 U
BZ# 44*	UG/KG	--	--	0.155	0.19 U	0.18 U	0.1 U
BZ# 49	UG/KG	--	--	0.093	**0.28 J**	**0.22 J**	0.062 U
BZ# 52*	UG/KG	--	--	0.165	0.2 U	0.19 U	0.11 U
BZ# 66*	UG/KG	--	--	0.213	0.26 U	0.25 U	0.14 U
BZ# 77*	UG/KG	--	--	0.160	0.19 U	0.19 U	0.11 U
BZ# 87	UG/KG	--	--	0.170	0.21 U	0.2 U	0.11 U
BZ# 101*	UG/KG	--	--	0.143	**0.25 J PG**	**0.32 J PG**	**0.098 J**
BZ# 105*	UG/KG	--	--	0.175	0.21 U	0.2 U	0.12 U
BZ# 118*	UG/KG	--	--	0.129	**0.22 J**	**0.2 J**	0.086 U
BZ# 126*	UG/KG	--	--	0.145	0.18 U	0.17 U	0.097 U
BZ# 128*	UG/KG	--	--	0.188	0.23 U	0.22 U	0.12 U
BZ# 138*	UG/KG	--	--	0.155	**0.19 J PG**	**0.26 J**	0.1 U
BZ# 153*	UG/KG	--	--	0.173	**0.41 J**	**0.28 J PG**	0.12 U
BZ# 156	UG/KG	--	--	0.175	0.21 U	0.2 U	0.12 U
BZ# 169*	UG/KG	--	--	0.225	0.27 U	0.26 U	0.15 U
BZ# 170*	UG/KG	--	--	0.113	0.14 U	0.13 U	0.076 U
BZ# 180*	UG/KG	--	--	0.096	0.12 U	**0.2 J PG**	0.065 U
BZ# 183	UG/KG	--	--	0.118	0.14 U	0.14 U	0.079 U
BZ# 184	UG/KG	--	--	0.101	0.12 U	0.12 U	0.066 U
BZ# 187*	UG/KG	--	--	0.198	0.24 U	0.23 U	0.13 U
BZ# 195	UG/KG	--	--	0.165	0.2 U	0.19 U	0.11 U
BZ# 206	UG/KG	--	--	0.097	0.12 U	0.11 U	0.066 U
BZ# 209	UG/KG	--	--	0.213	0.26 U	0.25 U	0.14 U
TOTAL PCBs (ND=0)	UG/KG	21.54	188.78	--	**2.56**	**3.46**	**0.196**

* PCB congeners used for Total PCB summation, as per Table 9-3 of the ITM (USEPA/USACE 1998)

Source : Buchman, M.F. 1999. NOAA Screening Quick Reference Table, NOAA HAZMAT Report 99-1, Seattle, WA

NOTE: bold values represent detected concentrations.

MDL = method detection limit

TEL = threshold effects level

PEL = probable effects level

PG = the percent difference between the original and confirmation analyses is greater than 40%

J = compound was detected, but below the reporting limit (value is estimated)

U = compound was analyzed, but not detected

TABLE 4-6 CHLORINATED PESTICIDE CONCENTRATIONS (UG/KG) IN SEDIMENTS FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	UNITS	TEL*	PEL*	MDL	PNSREF02	PNS02-02	PNS02-05
4,4'-DDD	UG/KG	1.22	7.81	0.50	0.59 U	0.57 U	0.39 U
4,4'-DDE	UG/KG	2.07	374.17	0.16	0.18 U	0.18 U	0.12 U
4,4'-DDT	UG/KG	1.19	4.77	0.18	0.21 U	0.2 U	0.14 U
ALDRIN	UG/KG	--	--	0.19	0.22 U	0.21 U	0.15 U
ALPHA-BHC	UG/KG	--	--	0.14	0.17 U	0.16 U	0.11 U
BETA-BHC	UG/KG	--	--	0.21	0.25 U	0.24 U	0.17 U
CHLORDANE	UG/KG	2.26	4.79	0.87	1 U	0.99 U	0.68 U
CHLOROBENSIDE	UG/KG	--	--	0.48	0.57 U	0.55 U	0.38 U
DACHTAL	UG/KG	--	--	0.35	0.41 U	0.4 U	0.27 U
DELTA-BHC	UG/KG	--	--	0.14	0.16 U	0.15 U	0.11 U
DIELDRIN	UG/KG	0.715	4.3	0.15	0.18 U	0.17 U	0.12 U
ENDOSULFAN I	UG/KG	--	--	0.36	**6**	0.4 U	0.27 U
ENDOSULFAN II	UG/KG	--	--	0.20	**11**	0.22 U	0.15 U
ENDOSULFAN SULFATE	UG/KG	--	--	0.21	**0.97 J**	0.24 U	0.17 U
ENDRIN	UG/KG	--	--	0.16	0.19 U	0.18 U	0.12 U
ENDRIN ALDEHYDE	UG/KG	--	--	0.17	0.2 U	0.19 U	0.13 U
GAMMA-BHC	UG/KG	0.32	0.99	0.18	0.21 U	0.21 U	0.14 U
HEPTACHLOR	UG/KG	--	--	0.23	0.27 U	0.26 U	0.18 U
HEPTACHLOR EPOXIDE	UG/KG	--	--	0.15	0.18 U	0.17 U	0.12 U
METHOXYCHLOR	UG/KG	--	--	0.61	0.72 U	0.69 U	0.48 U
MIREX	UG/KG	--	--	0.16	0.18 U	0.18 U	0.12 U
TOXAPHENE	UG/KG	--	--	3.85	4.6 U	4.4 U	3 U

***Source**: Buchman, M.F. 1999. NOAA Screening Quick Reference Table, NOAA HAZMAT Report 99-1, Seattle, WA

NOTE: bold values represent detected concentrations.

MDL = method detection limit

TEL = threshold effects level

PEL = probable effects level

PG = percent difference between the original and confirmation analyses is greater than 40%

J = compound was detected, but below the reporting limit (value is estimated)

U = compound was analyzed, but not detected

TABLE 4-7 ORGANOPHOSPHORUS PESTICIDE CONCENTRATIONS (UG/KG) IN SEDIMENTS FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	UNITS	MDL	PNSREF02	PNS02-02	PNS02-05
AZINPHOS METHYL	UG/KG	7.12	8.4 U	8.1 U	5.6 U
DEMETON	UG/KG	12.07	14 U	14 U	9.5 U
ETHYL PARATHION	UG/KG	6.92	8.2 U	7.9 U	5.4 U
MALATHION	UG/KG	7.85	9.3 U	9 U	6.2 U
METHYL PARATHION	UG/KG	5.98	7.1 U	6.8 U	4.7 U

There are no TEL and PEL values for the organophosphorus pesticides.
MDL = method detection limit
U = compound was analyzed, but not detected

TABLE 4-8 SVOC CONCENTRATIONS (UG/KG) IN SEDIMENTS FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	UNITS	TEL*	PEL*	MDL	PNSREF02	PNS02-02	PNS02-05
1,2,4-TRICHLOROBENZENE	UG/KG	--	--	43	50 U	49 U	33 U
1,2-DIPHENYLHYDRAZINE	UG/KG	--	--	35	42 U	40 U	28 U
2,2'-OXYBIS(1-CHLOROPROPANE)	UG/KG	--	--	66	79 U	76 U	52 U
2,4,6-TRICHLOROPHENOL	UG/KG	--	--	29	34 U	33 U	22 U
2,4-DICHLOROPHENOL	UG/KG	--	--	43	50 U	49 U	33 U
2,4-DIMETHYLPHENOL	UG/KG	--	--	35	42 U	40 U	28 U
2,4-DINITROPHENOL	UG/KG	--	--	613	730 U	700 U	480 U
2,4-DINITROTOLUENE	UG/KG	--	--	37	44 U	42 U	29 U
2,6-DINITROTOLUENE	UG/KG	--	--	31	36 U	35 U	24 U
2-CHLORONAPHTHALENE	UG/KG	--	--	37	43 U	42 U	29 U
2-CHLOROPHENOL	UG/KG	--	--	70	83 U	80 U	55 U
2-METHYLPHENOL	UG/KG	--	--	60	71 U	69 U	47 U
2-NITROPHENOL	UG/KG	--	--	56	66 U	64 U	44 U
3,3'-DICHLOROBENZIDINE	UG/KG	--	--	24	29 U	28 U	19 U
4,6-DINITRO-2-METHYLPHENOL	UG/KG	--	--	26	31 U	30 U	21 U
4-BROMOPHENYL PHENYL ETHER	UG/KG	--	--	34	40 U	39 U	27 U
4-CHLORO-3-METHYLPHENOL	UG/KG	--	--	35	41 U	40 U	27 U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	--	--	28	33 U	32 U	22 U
4-METHYLPHENOL	UG/KG	--	--	91	110 U	100 U	72 U
4-NITROPHENOL	UG/KG	--	--	28	33 U	32 U	22 U
BENZOIC ACID	UG/KG	--	--	47	56 U	54 U	37 U
BENZYL ALCOHOL	UG/KG	--	--	120	140 U	140 U	93 U
BIS(2-CHLOROETHOXY)METHANE	UG/KG	--	--	46	54 U	52 U	36 U
BIS(2-CHLOROETHYL) ETHER	UG/KG	--	--	47	55 U	53 U	37 U
BIS(2-ETHYLHEXYL) PHTHALATE	UG/KG	182.16	2646.51	40	47 U	45 U	31 U
BUTYL BENZYL PHTHALATE	UG/KG	--	--	44	51 U	50 U	34 U
DI-N-BUTYL PHTHALATE	UG/KG	--	--	37	43 U	42 U	29 U
DI-N-OCTYL PHTHALATE	UG/KG	--	--	35	42 U	40 U	28 U
DIBENZOFURAN	UG/KG	--	--	38	45 U	44 U	30 U
DIETHYL PHTHALATE	UG/KG	--	--	38	44 U	43 U	29 U
DIMETHYL PHTHALATE	UG/KG	--	--	33	39 U	38 U	26 U
HEXACHLOROBENZENE	UG/KG	--	--	33	39 U	38 U	26 U
HEXACHLOROBUTADIENE	UG/KG	--	--	56	66 U	64 U	44 U
HEXACHLOROCYCLOPENTADIENE	UG/KG	--	--	28	33 U	31 U	22 U
HEXACHLOROETHANE	UG/KG	--	--	56	66 U	64 U	44 U
ISOPHORONE	UG/KG	--	--	53	63 U	61 U	42 U
N-NITROSODI-N-PROPYLAMINE	UG/KG	--	--	41	48 U	47 U	32 U
N-NITROSODIMETHYLAMINE	UG/KG	--	--	54	64 U	62 U	43 U
N-NITROSODIPHENYLAMINE	UG/KG	--	--	46	54 U	52 U	36 U
NITROBENZENE	UG/KG	--	--	51	60 U	58 U	40 U
PENTACHLOROPHENOL	UG/KG	--	--	28	33 U	32 U	22 U
PHENOL	UG/KG	--	--	45	53 U	51 U	35 U

Source: Buchman, M.F. 1999. NOAA Screening Quick Reference Table, NOAA HAZMAT Report 99-1, Seattle, WA.

NOTE: Shaded and bold values represent detected concentration

MDL = method detection limi

TEL = threshold effects leve

PEL = probable effects leve

U = compound was analyzed, but not detecte

TABLE 4-9 BUTYLTIN CONCENTRATIONS (UG/KG) IN SEDIMENTS FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	UNITS	MDL	PNSREF02	PNS02-02	PNS02-05
DIBUTYLTIN	UG/KG	3.18	4.5 U	3.7 U	2.1 U
MONOBUTYLTIN	UG/KG	2.42	3.4 U	2.8 U	1.6 U
TRIBUTYLTIN	UG/KG	3.67	5.2 U	4.3 U	2.4 U

There are no TEL and PEL values for the tested butyltins.
MDL = method detection limit
U = compound was analyzed, but not detected

TABLE 4-10 THEORETICAL BIOACCUMULATION POTENTIAL FOR PAHs IN TISSUE

ANALYTE	% TOC / UNITS	PNSREF02	PNS02-02	PNS02-05
		3.34	2.24	1.45
ACENAPHTHENE	UG/KG	12.93	**114.29**	10.48
ACENAPHTHYLENE	UG/KG	11.50	**210.71**	6.07
ANTHRACENE	UG/KG	23.95	**464.29**	**28.14**
BENZ(A)ANTHRACENE	UG/KG	105.39	**1,428.57**	71.72
BENZO(A)PYRENE	UG/KG	138.92	**1,642.86**	71.72
BENZO(B)FLUORANTHENE	UG/KG	217.96	**1,428.57**	66.21
BENZO(GHI)PERYLENE	UG/KG	126.95	**1,285.71**	60.69
BENZO(K)FLUORANTHENE	UG/KG	ND	**1,035.71**	**51.31**
CHRYSENE	UG/KG	124.55	**1,535.71**	82.76
DIBENZ(A,H)ANTHRACENE	UG/KG	45.51	**464.29**	22.62
FLUORANTHENE	UG/KG	196.41	**3,357.14**	165.52
FLUORENE	UG/KG	9.82	**160.71**	**11.03**
INDENO(1,2,3-CD)PYRENE	UG/KG	102.99	**1,071.43**	48.55
1-METHYLNAPHTHALENE	UG/KG	ND	**26.07**	**7.72**
2-METHYLNAPHTHALENE	UG/KG	ND	**31.07**	**3.92**
NAPHTHALENE	UG/KG	ND	**67.86**	**7.17**
PHENANTHRENE	UG/KG	93.41	**1,392.86**	**93.79**
PYRENE	UG/KG	191.62	**2,821.43**	137.93
TOTAL PAHs (ND=0)	UG/KG	2,769.58	**18,539.29**	935.72

Values based on a two percent lipid content for tissue

NOTE: bold values represent TBP values that exceed the reference site

NA = not applicable

ND = chemical constituent was not detected in the sediment sample, therefore the TBP value was not calculated

TABLE 4-11 THEORETICAL BIOACCUMULATION POTENTIAL FOR PCB CONGENERS IN TISSUE

ANALYTE	% TOC UNITS	PNSREF02 3.34	PNS02-02 2.24	PNS02-05 1.45
BZ# 8*	UG/KG	0.50	**1.68**	ND
BZ# 18*	UG/KG	ND	ND	ND
BZ# 28*	UG/KG	ND	ND	ND
BZ# 44*	UG/KG	ND	ND	ND
BZ# 49	UG/KG	0.67	**0.79**	ND
BZ# 52*	UG/KG	ND	ND	ND
BZ# 66*	UG/KG	ND	ND	ND
BZ# 77*	UG/KG	ND	ND	ND
BZ# 87	UG/KG	ND	ND	ND
BZ# 101*	UG/KG	0.60	**1.14**	0.54
BZ# 105*	UG/KG	ND	ND	ND
BZ# 118*	UG/KG	0.53	**0.71**	ND
BZ# 126*	UG/KG	ND	ND	ND
BZ# 128*	UG/KG	ND	ND	ND
BZ# 138*	UG/KG	0.46	**0.93**	ND
BZ# 153*	UG/KG	0.98	**1.00**	ND
BZ# 156	UG/KG	ND	ND	ND
BZ# 169*	UG/KG	ND	ND	ND
BZ# 170*	UG/KG	ND	ND	ND
BZ# 180*	UG/KG	ND	**0.71**	ND
BZ# 183	UG/KG	ND	ND	ND
BZ# 184	UG/KG	ND	ND	ND
BZ# 187*	UG/KG	ND	ND	ND
BZ# 195	UG/KG	ND	ND	ND
BZ# 206	UG/KG	ND	ND	ND
BZ# 209	UG/KG	ND	ND	ND
TOTAL PCBs (ND=0)	UG/KG	6.13	**12.36**	1.08

Values based on a two percent lipid content for tissue

* PCB congeners used for Total PCB summation, as per Table 9-3 of the ITM (USEPA/USACE 1998)

NOTE: bold values represent TBP values that exceed the reference site

NA = not applicable

ND = chemical constituent was not detected in the sediment sample, therefore the TBP value was not calculated

TABLE 4-12 NUTRIENTS AND GENERAL CHEMISTRY PARAMETERS OF SITE WATER AND ELUTRIATES FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	USEPA ACUTE CRITERIA*	USEPA CHRONIC CRITERIA*	UNITS	MDL	PNS02-04-SW [a]	PNSREF02	PNS02-02	PNS02-05
AMMONIA, as N[(b)]	9.42	1.41	MG/L	1.254	0.037 U	**0.12**	**2.5b**	**1.2**
NITROGEN, NITRATE AS N	--	--	MG/L	0.5	**0.46**	**0.36**	0.5 U	0.5 U
NITROGEN, NITRITE AS N	--	--	MG/L	0.5	0.005 U	0.005 U	0.5 U	0.5 U
NITROGEN, TOTAL KJELDAHL	--	--	MG/L	0.62	**1.1**	**1.7**	**19.8**	**2.3**
CYANIDE, TOTAL	0.001	0.001	UG/L	1.6	**4 B Jab**	**2 B Jab**	**265 Jab**	**4 B Jab**
CARBON, TOTAL ORGANIC	--	--	MG/L	0.16	0.22 U	0.22 U	**1.9**	**1.2**
PHOSPHORUS, TOTAL	--	--	MG/L	0.011	0.011 U	0.011 U	0.011 U	**0.049 B**
SULFIDE	--	--	MG/L	0.5	**2.5**	**2.5**	**2.1**	**11.4**

(a) elutriate preparation water

(b) based on salinity=25 ppt, water temperatute=12 C, and pH=8.

**Sources* : USEPA 1999 [63 Federal Register 68354-68364]

NOTE: bold values represent detected concentrations.

MDL = method detection limit

B = compound was detected, but below the reporting limit (value is estimated)

J = detected in the laboratory method blank

U = compound was analyzed, but not detected

a = exceeds acute water quality criterion

b = exceeds chronic water quality criterion

TABLE 4-13 METAL CONCENTRATIONS (UG/L) IN SITE WATER AND ELUTRIATES FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	USEPA ACUTE CRITERIA*	USEPA CHRONIC CRITERIA*	UNITS	MDL	PNS02-04-SW [a]	PNSREF02	PNS02-02	PNS02-05
ALUMINUM	--	--	UG/L	20	20 UN	20 UN	20 UN	20 UN
ANTIMONY	--	--	UG/L	0.6	0.6 U	0.6 U	**2.2 B**	**1.4 B**
ARSENIC	69	36	UG/L	0.2	**3**	**1.4**	**5.1**	**3.9**
BERYLLIUM	--	--	UG/L	0.2	0.2 U	0.2 U	0.2 U	0.2 U
CADMIUM	42	9.3	UG/L	1.5	1.5 U	1.5 U	1.5 U	1.5 U
CHROMIUM	1,100	50	UG/L	0.5	1.5 U	**0.99 B**	**0.9 B**	**1.1**
COBALT	--	--	UG/L	2	2 U	2 U	2 U	2 U
COPPER	4.8	3.1	UG/L	1	**1.5**	**3.5**	**1.4**	**1.4**
IRON	--	--	UG/L	15	15 U	**61.7**	15 U	15 U
LEAD	210	8.1	UG/L	0.6	0.6 U	0.6 U	0.6 U	0.6 U
MANGANESE	--	--	UG/L	1	**3.5**	**6.2**	**32.5**	**27**
MERCURY	1.8	0.94	UG/L	0.1	0.1 U	0.1 U	0.1 U	0.1 U
NICKEL	74	8.2	UG/L	1	1 U	1 U	1 U	1 U
SELENIUM	290	71	UG/L	0.5	0.5 U	0.5 U	0.5 U	0.5 U
SILVER	1.9	--	UG/L	0.6	0.6 U	**1.8 B**	0.6 U	0.6 U
THALLIUM	--	--	UG/L	0.6	0.6 U	0.6 U	0.6 U	0.6 U
TIN	--	--	UG/L	0.6	**0.66 B**	0.6 U	0.6 U	**0.61 B**
ZINC	90	81	UG/L	5	5 U	**11.4**	**8**	**6.2**

(a) elutriate preparation water

**Sources* : USEPA 1999 [63 Federal Register 68354-68364]

NOTE: bold values represent detected concentrations.

MDL = method detection limit

B = compound was detected, but below the reporting limit (value is estimated)

N = spiked sample recovery is not within control limits

U = compound was analyzed, but not detected

TABLE 4-14 PAH CONCENTRATIONS (UG/L) IN SITE WATER AND ELUTRIATES FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	UNITS	MDL	PNS02-04-SW [a]	PNSREF02	PNS02-02	PNS02-05
ACENAPHTHENE	UG/L	0.038	0.038 U	0.038 U	**0.04 J**	0.038 U
ACENAPHTHYLENE	UG/L	0.035	0.035 U	0.035 U	0.035 U	0.035 U
ANTHRACENE	UG/L	0.025	0.025 U	0.025 U	0.025 U	0.025 U
BENZO(A)ANTHRACENE	UG/L	0.022	0.022 U	0.022 U	0.022 U	0.022 U
BENZO(A)PYRENE	UG/L	0.025	0.025 U	0.025 U	0.025 U	0.025 U
BENZO(B)FLUORANTHENE	UG/L	0.025	0.025 U	0.025 U	0.025 U	0.025 U
BENZO(K)FLUORANTHENE	UG/L	0.02	0.02 U	0.02 U	0.02 U	0.02 U
BENZO(GHI)PERYLENE	UG/L	0.03	0.03 U	0.03 U	0.03 U	0.03 U
CHRYSENE	UG/L	0.017	0.017 U	0.017 U	0.017 U	0.017 U
DIBENZO(A,H)ANTHRACENE	UG/L	0.031	0.031 U	0.031 U	0.031 U	0.031 U
FLUORANTHENE	UG/L	0.031	0.031 U	0.031 U	0.031 U	0.031 U
FLUORENE	UG/L	0.036	0.036 U	0.036 U	0.036 U	0.036 U
INDENO(1,2,3-CD)PYRENE	UG/L	0.025	0.025 U	0.025 U	0.025 U	0.025 U
1-METHYLNAPHTHALENE	UG/L	0.084	0.084 U	0.084 U	0.084 U	0.084 U
2-METHYLNAPHTHALENE	UG/L	0.05	0.05 U	0.05 U	0.05 U	0.05 U
NAPHTHALENE	UG/L	0.038	0.038 U	0.038 U	0.038 U	0.038 U
PHENANTHRENE	UG/L	0.031	0.031 U	0.031 U	0.031 U	0.031 U
PYRENE	UG/L	0.024	0.024 U	0.024 U	0.024 U	0.024 U
TOTAL PAHs (ND=0)	UG/L	--	0	0	**0.04**	0

(a) elutriate preparation water

There are no USEPA saltwater acute or chronic criteria for aquatic life for the tested PAHs or total PAH concentrations.

NOTE: bold values represent detected concentrations.

MDL = method detection limit

J = compound was detected, but below the reporting limit (value is estimated)

U = compound was analyzed, but not detected

TABLE 4-15 PCB CONGENER CONCENTRATIONS (NG/L) IN SITE WATER AND ELUTRIATES FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	UNITS	MDL	PNS02-04-SW [a]	PNSREF02	PNS02-02	PNS02-05
BZ# 8*	NG/L	0.36	0.38 U	0.36 U	**0.89 J**	**0.85 J**
BZ# 18*	NG/L	0.32	0.38 U	0.32 U	0.32 U	0.32 U
BZ# 28*	NG/L	0.41	0.44 U	0.41 U	0.41 U	0.41 U
BZ# 44*	NG/L	0.43	**0.47 J PG**	0.43 U	0.43 U	0.43 U
BZ# 49	NG/L	0.43	0.28 U	0.43 U	0.43 U	0.43 U
BZ# 52*	NG/L	0.41	0.43 U	0.41 U	0.41 U	0.41 U
BZ# 66*	NG/L	0.43	0.48 U	0.43 U	0.43 U	0.43 U
BZ# 77*	NG/L	0.4	0.48 U	0.4 U	0.4 U	0.4 U
BZ# 87	NG/L	0.34	0.43 U	0.34 U	0.34 U	0.34 U
BZ# 101*	NG/L	0.4	0.48 U	0.4 U	0.4 U	0.4 U
BZ# 105*	NG/L	0.37	0.47 U	0.37 U	0.37 U	0.37 U
BZ# 118*	NG/L	0.44	0.49 U	0.44 U	0.44 U	0.44 U
BZ# 126*	NG/L	0.47	0.32 U	**0.81 J PG**	0.47 U	0.47 U
BZ# 128*	NG/L	0.38	0.5 U	0.38 U	0.38 U	0.38 U
BZ# 138*	NG/L	0.38	0.49 U	**0.64 J PG**	0.38 U	0.38 U
BZ# 153*	NG/L	0.39	0.46 U	0.39 U	0.39 U	0.39 U
BZ# 156	NG/L	0.4	0.44 U	0.4 U	0.4 U	0.4 U
BZ# 169*	NG/L	0.43	0.24 U	0.43 U	0.43 U	0.43 U
BZ# 170*	NG/L	0.45	0.23 U	0.45 U	0.45 U	0.45 U
BZ# 180*	NG/L	0.46	0.29 U	**0.65 J PG**	0.46 U	0.46 U
BZ# 183	NG/L	0.34	0.5 U	0.34 U	0.34 U	0.34 U
BZ# 184	NG/L	0.44	0.23 U	0.44 U	0.44 U	0.44 U
BZ# 187*	NG/L	0.39	**0.53 J PG**	0.39 U	0.39 U	0.39 U
BZ# 195	NG/L	0.42	0.29 U	0.42 U	0.42 U	0.42 U
BZ# 206	NG/L	0.47	**0.52 J PG**	0.47 U	0.47 U	0.47 U
BZ# 209	NG/L	0.46	0.26 U	0.46 U	0.46 U	0.46 U
TOTAL PCBs (ND=0)	NG/L	--	**4**	**4.2**	**1.78**	**1.7**

(a) elutriate preparation water

* PCB congeners used for Total PCB summation, as per Table 9-3 of the ITM (USEPA/USACE 1998)

There are no USEPA saltwater acute or chronic criteria for aquatic life for the tested PCB congeners or total PCB concentratio

NOTE: bold values represent detected concentrations

MDL = method detection limit

PG = the percent difference between the original and confirmation analyses is greater than 40%

J = compound was detected, but below the reporting limit (value is estimated)

U = compound was analyzed, but not detected

TABLE 4-16 ORGANOPHOSPHORUS PESTICIDE CONCENTRATIONS (UG/L) IN SITE WATER AND ELUTRIATES FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	USEPA ACUTE CRITERIA*	USEPA CHRONIC CRITERIA*	UNITS	MDL	PNS02-04-SW [a]	PNSREF02	PNS02-02	PNS02-05
AZINPHOS-METHYL	--	0.1	UG/L	0.36	0.36 U	0.36 U	0.36 U	0.36 U
DEMETON (TOTAL)	--	0.1	UG/L	0.53	0.53 U	0.53 U	0.53 U	0.53 U
ETHYL PARATHION	--	--	UG/L	0.53	0.53 U	0.53 U	0.53 U	0.53 U
MALATHION	--	0.1	UG/L	0.4	0.4 U	0.4 U	0.4 U	0.4 U
METHYL PARATHION	--	--	UG/L	0.27	0.27 U	0.27 U	0.27 U	0.27 U

(a) elutriate preparation water

**Sources* : USEPA 1999 [63 Federal Register 68354-68364]

There are no USEPA saltwater acute criteria for aquatic life for the tested organophosphorus pesticides.

NOTE: bold values represent detected concentrations.

MDL = method detection limit

U = compound was analyzed, but not detected

TABLE 4-17 CHLORINATED PESTICIDE CONCENTRATIONS (UG/L) IN SITE WATER AND ELUTRIATES FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	USEPA ACUTE CRITERIA*	USEPA CHRONIC CRITERIA*	UNITS	MDL	PNS02-04-SW [a]	PNSREF02	PNS02-02	PNS02-05
4,4'-DDD	--	--	UG/L	0.002	0.002 U	0.002 U	0.002 U	0.002 U
4,4'-DDE	--	--	UG/L	0.0009	0.0009 U	0.0009 U	0.0009 U	0.0009 U
4,4'-DDT	0.13	0.001	UG/L	0.0009	0.0009 U	0.0009 U	0.0009 U	0.0009 U
ALDRIN	1.3	--	UG/L	0.0013	0.0013 U	0.0013 U	0.0013 U	0.0013 U
ALPHA-BHC	--	--	UG/L	0.0012	0.0012 U	0.0012 U	0.0012 U	0.0012 U
BETA-BHC	--	--	UG/L	0.0018	0.0018 U	0.0018 U	0.0018 U	0.0018 U
CHLORDANE	--	--	UG/L	0.01	0.01 U	0.01 U	0.01 U	0.01 U
CHLOROBENSIDE	--	--	UG/L	0.0034	0.0034 U	0.0034 U	0.0034 U	0.0034 U
DACHTAL	--	--	UG/L	0.0013	0.0013 U	0.0013 U	0.0013 U	0.0013 U
DELTA-BHC	--	--	UG/L	0.00065	0.00065 U	0.00065 U	0.00065 U	0.00065 U
DIELDRIN	0.71	0.0019	UG/L	0.0015	0.0015 U	0.0015 U	0.0015 U	0.0015 U
ENDOSULFAN I	0.034	0.0087	UG/L	0.002	0.002 U	**0.026**	0.002 U	0.002 U
ENDOSULFAN II	0.034	0.0087	UG/L	0.0015	0.0015 U	**0.018**	0.0015 U	0.0015 U
ENDOSULFAN SULFATE	--	--	UG/L	0.0012	0.0012 U	0.0012 U	0.0012 U	0.0012 U
ENDRIN	0.037	0.0023	UG/L	0.0025	0.0025 U	0.0025 U	0.0025 U	0.0025 U
ENDRIN ALDEHYDE	--	--	UG/L	0.00084	0.00084 U	0.00084 U	0.00084 U	0.00084 U
GAMMA-BHC	0.16	--	UG/L	0.0013	0.0013 U	0.0013 U	0.0013 U	0.0013 U
HEPTACHLOR	0.053	0.0036	UG/L	0.0015	0.0015 U	0.0015 U	0.0015 U	0.0015 U
HEPTACHLOR EPOXIDE	0.053	0.0036	UG/L	0.00072	0.00072 U	0.00072 U	0.00072 U	0.00072 U
METHOXYCHLOR	--	0.03	UG/L	0.0023	0.0023 U	0.0023 U	0.0023 U	0.0023 U
MIREX	--	0.001	UG/L	0.00064	0.00064 U	0.00064 U	0.00064 U	0.00064 U
TOXAPHENE	0.21	0.0002	UG/L	0.033	0.033 U	0.033 U	0.033 U	0.033 U

(a) elutriate preparation water

**Sources* : USEPA 1999 [63 Federal Register 68354-68364]

NOTE: bold values represent detected concentrations.

MDL = method detection limit

U = compound was analyzed, but not detected

TABLE 4-18 SVOC CONCENTRATIONS (UG/L) IN SITE WATER AND ELUTRIATES FROM THE NAVAL STATION PENSACOLA TURNING BASIN, PENSACOLA, FLORIDA (MARCH 2002)

ANALYTE	USEPA ACUTE CRITERIA*	USEPA CHRONIC CRITERIA*	UNITS	MDL	PNS02-04-SW *	PNSREF02	PNS02-02	PNS02-05
1,2,4-TRICHLOROBENZENE	--	--	UG/L	1.4	1.4 U	1.4 U	1.4 U	1.4 U
1,2-DICHLOROBENZENE	--	--	UG/L	1.4	1.4 U	1.4 U	1.4 U	1.4 U
1,2-DIPHENYLHYDRAZINE	--	--	UG/L	1.3	1.3 U	1.3 U	1.3 U	1.3 U
1,3-DICHLOROBENZENE	--	--	UG/L	1.3	1.3 U	1.3 U	1.3 U	1.3 U
1,4-DICHLOROBENZENE	--	--	UG/L	1.3	1.3 U	1.3 U	1.3 U	1.3 U
2,2'-OXYBIS(1-CHLOROPROPANE)	--	--	UG/L	1.7	1.7 U	1.7 U	1.7 U	1.7 U
2,4,6-TRICHLOROPHENOL	--	--	UG/L	1.5	1.5 U	1.5 U	1.5 U	1.5 U
2,4-DICHLOROPHENOL	--	--	UG/L	1.3	1.3 U	1.3 U	1.3 U	1.3 U
2,4-DIMETHYLPHENOL	--	--	UG/L	1.8	1.8 U	1.8 U	1.8 U	1.8 U
2,4-DINITROPHENOL	--	--	UG/L	1.6	1.6 U	1.6 U	15 U	15 U
2,4-DINITROTOLUENE	--	--	UG/L	1.3	1.3 U	1.3 U	1.3 U	1.3 U
2,6-DINITROTOLUENE	--	--	UG/L	1.4	1.4 U	1.4 U	1.4 U	1.4 U
2-CHLORONAPHTHALENE	--	--	UG/L	1.4	1.4 U	1.4 U	1.4 U	1.4 U
2-CHLOROPHENOL	--	--	UG/L	1.4	1.4 U	1.4 U	1.4 U	1.4 U
2-METHYLPHENOL	--	--	UG/L	1.5	1.5 U	1.5 U	1.5 U	1.5 U
2-NITROPHENOL	--	--	UG/L	3	3 U	3 U	3 U	3 U
3,3'-DICHLOROBENZIDINE	--	--	UG/L	3.9	3.9 U	3.9 U	25 U	25 U
4,6-DINITRO-2-METHYLPHENOL	--	--	UG/L	1.4	1.4 U	1.4 U	9.6 U	9.6 U
4-BROMOPHENYL PHENYL ETHER	--	--	UG/L	1.2	1.2 U	1.2 U	1.2 U	1.2 U
4-CHLORO-3-METHYLPHENOL	--	--	UG/L	1.3	1.3 U	1.3 U	1.3 U	1.3 U
4-CHLOROPHENYL PHENYL ETHER	--	--	UG/L	1.6	1.6 U	1.6 U	1.6 U	1.6 U
4-METHYLPHENOL	--	--	UG/L	3.5	3.5 U	3.5 U	3.5 U	3.5 U
4-NITROPHENOL	--	--	UG/L	1.8	1.8 U	1.8 U	1.8 U	1.8 U
BENZOIC ACID	--	--	UG/L	2.1	2.1 U	2.1 U	39 U	39 U
BENZYL ALCOHOL	--	--	UG/L	1.9	1.9 U	1.9 U	1.9 U	1.9 U
BIS(2-CHLOROETHOXY)METHANE	--	--	UG/L	3.4	3.4 U	3.4 U	3.4 U	3.4 U
BIS(2-CHLOROETHYL) ETHER	--	--	UG/L	1.4	1.4 U	1.4 U	1.4 U	1.4 U
BIS(2-ETHYLHEXYL) PHTHALATE	--	--	UG/L	0.91	0.91 U	0.91 U	**3.2 J B**	**3.8 J B**
BUTYL BENZYL PHTHALATE	--	--	UG/L	1	1 U	1 U	1 U	1 U
DIBENZOFURAN	--	--	UG/L	1.5	1.5 U	1.5 U	1.5 U	1.5 U
DIETHYL PHTHALATE	--	--	UG/L	1.1	1.1 U	1.1 U	1.1 U	1.1 U
DIMETHYL PHTHALATE	--	--	UG/L	1.3	1.3 U	1.3 U	1.3 U	1.3 U
DI-N-BUTYL PHTHALATE	--	--	UG/L	1.1	1.1 U	1.1 U	1.1 U	1.1 U
DI-N-OCTYL PHTHALATE	--	--	UG/L	0.95	0.95 U	0.95 U	0.95 U	0.95 U
HEXACHLOROBENZENE	--	--	UG/L	0.00059	0.00059 U	0.00059 U	0.00059 U	0.00059 U
HEXACHLOROBUTADIENE	--	--	UG/L	1.5	1.5 U	1.5 U	1.5 U	1.5 U
HEXACHLOROCYCLOPENTADIENE	--	--	UG/L	6.3	6.3 U	6.3 U	6.3 U	6.3 U
HEXACHLOROETHANE	--	--	UG/L	1.4	1.4 U	1.4 U	1.4 U	1.4 U
ISOPHORONE	--	--	UG/L	1.4	1.4 U	1.4 U	1.4 U	1.4 U
NITROBENZENE	--	--	UG/L	1.5	1.5 U	1.5 U	1.5 U	1.5 U
N-NITROSODIMETHYLAMINE	--	--	UG/L	1.7	1.7 U	1.7 U	1.7 U	1.7 U
N-NITROSODI-N-PROPYLAMINE	--	--	UG/L	1.5	1.5 U	1.5 U	1.5 U	1.5 U
N-NITROSODIPHENYLAMINE	--	--	UG/L	4.2	4.2 U	4.2 U	4.2 U	4.2 U
PENTACHLOROPHENOL	13	7.9	UG/L	0.82	0.82 U	0.82 U	0.82 U	0.82 U
PHENOL	--	--	UG/L	2	2 U	2 U	2 U	2 U

(a) elutriate preparation water

Sources : USEPA 1999 [63 Federal Register 68354-68364

NOTE: bold values represent detected concentrations.

MDL = method detection limit

B = detected in the laboratory method blank

J = compound was detected, but below the reporting limit (value is estimated)

U = compound was analyzed, but not detected

TABLE 4-19 BUTYLTIN CONCENTRATIONS (UG/L) IN SITE WATER AND ELUTRIATES FROM THE NAVAL STATION PENSACOLA TURNING BASIN,

ANALYTE	USEPA ACUTE CRITERIA*	USEPA CHRONIC CRITERIA	UNITS	MDL	PNS02-04-SW [a]	PNSREF02	PNS02-02	PNS02-05
DIBUTYLTIN	--	--	UG/L	0.0384	0.038 U	0.038 U	0.038 U	0.039 U
MONOBUTYLTIN	--	--	UG/L	0.031	0.031 U	0.031 U	0.031 U	0.031 U
TRIBUTYLTIN	0.37	0.01	UG/L	0.0444	0.044 U	0.044 U	0.044 U	0.045 U

(a) elutriate preparation water

**Sources* : USEPA 1999 [63 Federal Register 68354-68364]

NOTE: bold values represent detected concentrations.

MDL = method detection limit

U = compound was analyzed, but not detected

TABLE 4-20 SUMMARY OF THE RESULTS FOR WATER COLUMN TOXICITY TESTS FOR THE NAVAL STATION PENSACOLA TURNING BASIN

SAMPLE IDENTIFICATION	Purple Sea Urchin *Arbacia punctulata*			Opossum Shrimp *Americamysis bahia*			Sheepshead Minnow *Cyprinodon variegatus*		
	67-hour[a] EC50 (% elutriate)	Statistical Difference 100% vs. Control[b]	Dilution Required to Achieve 0.01 EC50	96-hour LC50 (% elutriate)	Statistical Difference 100% vs. Control[b]	Dilution Required to Achieve 0.01 LC50	96-hour LC50 (% elutriate)	Statistical Difference 100% vs. Control[b]	Dilution Required to Achieve 0.01 LC50
PNS02-02	>100	No	NA	>100	No	NA	>100	No	NA
PNS02-05	>100	No	NA	>100	No	NA	>100	No	NA
Pensacola Bay Reference (PNSREF02)	>100	No	NA	>100	No	NA	>100	No	NA

(a) Test duration was extended past 48-hours to achieve full control development to the pluteus stag

(b) Statistical significance analyzed at P=0.05; survival (LC50) or normal development (EC50) in 100% elutriate significantly lower than the contro

NA = mixing calculation is not applicable if mean survival in 100% elutriate is not statistically lower than the mean survival in the laboratory contro

TABLE 5-1 SUMMARY OF RESULTS FOR WHOLE SEDIMENT TOXICITY TESTS FOR THE NAVAL STATION PENSACOLA TURNING BASIN

SAMPLE IDENTIFICATION	Estuarine Polychaete *Neanthes arenaceodata*			Estuarine Amphipod *Leptocheirus plumulosus*		
	10-Day Mean Survival (%)	Statistical Difference vs. Pensacola Bay Reference [(a)]	Greater than 10% difference with Reference?*	10-Day Mean Survival (%)	Statistical Difference vs. Pensacola Bay Reference [(a)]	Greater than 20% difference with Reference?*
Laboratory Control Sediment [(b)]	96	NA	-	95	NA	-
PNS02-02	88	No	-	79	No	-
PNS02-05	96	No	-	82	No	-
Pensacola Bay Reference Site (PNSREF02)	96	NA	-	84	NA	-

* = Criterion applicable only if test survival is statistically lower than reference survival.

(a) Statistical significance analyzed at P=0.05; turning basin sediments statistically compared to Pensacola Bay Reference Site

(b) Control serves as indicator for test acceptability/validity

NA = not applicable; control and reference survival not statistically compared as per USEPA/USACE guidelines (1998)

TABLE 5-2 SUMMARY OF RESULTS: BIOACCUMULATION SURVIVAL FOR PENSACOLA NAVAL STATION TURNING BASIN TEST SEDIMENTS

	BIOACCUMULATION TESTS	
	Sand worm *Nereis virens*	**Blunt-nose clam** *Macoma nasuta*
SAMPLE IDENTIFICATION	Mean 28-day Survival (%)	Mean 28-day Survival (%)
Laboratory Control Sediment	100	99
PNS02-02	100	98
PNS02-05	100	97
Pensacola Bay Reference Site (PNSREF02)	100	98

TABLE 5-3 NAVAL STATION PENSACOLA TURNING BASIN: MEAN METAL CONCENTRATIONS (MG/KG) IN *Nereis virens* (SAND WORM)

ANALYTE	UNITS	RL	PNSREF02	PNS02-02	PNS02-05
ALUMINUM	MG/KG	20	17.4	9.42	15.2
ANTIMONY	MG/KG	1	ND	0.436	ND
ARSENIC	MG/KG	1	2.68	2.64	**3.24 ***
BERYLLIUM	MG/KG	0.4	ND	ND	0.212
CADMIUM	MG/KG	0.5	ND	ND	ND
CHROMIUM	MG/KG	0.5	0.238	0.19	0.202
COBALT	MG/KG	5	ND	ND	ND
COPPER	MG/KG	2.5	1.32	1.42	1.26
IRON	MG/KG	10	69.2	40	42.3
LEAD	MG/KG	0.3	0.33	0.318	0.224
MANGANESE	MG/KG	1.5	0.684	0.632	0.67
MERCURY	MG/KG	0.033	0.036	0.03	0.0438
NICKEL	MG/KG	4	ND	ND	ND
SELENIUM	MG/KG	0.5	0.566	0.67	0.534
SILVER	MG/KG	0.5	ND	ND	ND
THALLIUM	MG/KG	1.07	ND	ND	ND
TIN	MG/KG	10	3.88	3.9	3.98
ZINC	MG/KG	2	9.48	18.7	18.6

***NOTE**: Shaded and bold values indicate sites where mean tissue residues are significantly higher than the reference site ($p<0.05$).

RL = average reporting limit

ND = not detected in any of the five tested tissue replicates

TABLE 5-4 NAVAL STATION PENSACOLA TURNING BASIN: MEAN METAL CONCENTRATIONS (MG/KG) IN *Macoma nasuta* (BLUNT-NOSE CLAM)

ANALYTE	UNITS	RL	PNSREF02	PNS02-02	PNS02-05
ALUMINUM	MG/KG	20	37.6	26.1	22.9
ANTIMONY	MG/KG	1	0.362	0.312	0.252
ARSENIC	MG/KG	1	3.76	3.74	3.84
BERYLLIUM	MG/KG	0.4	0.194	0.196	0.23
CADMIUM	MG/KG	0.5	ND	ND	ND
CHROMIUM	MG/KG	0.5	0.31	0.294	0.266
COBALT	MG/KG	5	1.58	2.04	1.56
COPPER	MG/KG	2.5	4.42	4.46	2.66
IRON	MG/KG	10	136	128	98.3
LEAD	MG/KG	0.3	0.552	0.624	0.452
MANGANESE	MG/KG	1.5	3	3.04	1.9
MERCURY	MG/KG	0.033	0.0458	0.0394	0.0272
NICKEL	MG/KG	4	0.848	0.59	0.576
SELENIUM	MG/KG	0.5	0.54	0.526	0.51
SILVER	MG/KG	0.5	ND	ND	ND
THALLIUM	MG/KG	1	ND	ND	ND
TIN	MG/KG	10	3.48	3.52	3.56
ZINC	MG/KG	2	19.7	19.4	19.9

***NOTE**: Shaded and bold values indicate sites where mean tissue residues are significantly higher than the reference site ($p<0.05$).
RL = average reporting limit
ND = not detected in any of the five tested tissue replicates

TABLE 5-5 NAVAL STATION PENSACOLA TURNING BASIN: MEAN PAH CONCENTRATIONS (UG/KG) IN *Nereis virens* (SAND WORM)

ANALYTE	UNITS	MDL	PNSREF02	PNS02-02
1-METHYLNAPHTHALENE	UG/KG	8	ND	ND
2-METHYLNAPHTHALENE	UG/KG	8	ND	ND
ACENAPHTHENE	UG/KG	8	ND	3.48
ACENAPHTHYLENE	UG/KG	8	ND	ND
ANTHRACENE	UG/KG	8	ND	ND
BENZ(A)ANTHRACENE	UG/KG	8	ND	3.52
BENZO(A)PYRENE	UG/KG	8	ND	ND
BENZO(B)FLUORANTHENE	UG/KG	8	ND	ND
BENZO(GHI)PERYLENE	UG/KG	8	ND	ND
BENZO(K)FLUORANTHENE	UG/KG	8	ND	ND
CHRYSENE	UG/KG	8	ND	3.52
DIBENZ(A,H)ANTHRACENE	UG/KG	8	ND	ND
FLUORANTHENE	UG/KG	8	ND	3.58
FLUORENE	UG/KG	8	ND	ND
INDENO(1,2,3-CD)PYRENE	UG/KG	8	ND	ND
NAPHTHALENE	UG/KG	8	ND	ND
PHENANTHRENE	UG/KG	8	ND	3.9
PYRENE	UG/KG	8	ND	3.94
TOTAL PAHS (ND=RL)	UG/KG	--	144	132

PAHs were not tested for PNS02-03, PNS02-04, and PNS02-05 based on the results of the sediment chemistry analyses.

***NOTE**: Shaded and bold values indicate sites where mean tissue residues are significantly higher than the mean reference tissue ($p<0.05$).

MDL = method detection limit

ND = not detected in any of the five tested tissue replicates

TABLE 5-6 NAVAL STATION PENSACOLA TURNING BASIN: MEAN PAH CONCENTRATIONS (UG/KG) IN *Macoma nasuta* (BLUNT-NOSE CLAM)

ANALYTE	UNITS	RL	PNSREF02	PNS02-02
1-METHYLNAPHTHALENE	UG/KG	8	ND	ND
2-METHYLNAPHTHALENE	UG/KG	8	ND	ND
ACENAPHTHENE	UG/KG	8	ND	ND
ACENAPHTHYLENE	UG/KG	8	ND	ND
ANTHRACENE	UG/KG	8	ND	ND
BENZ(A)ANTHRACENE	UG/KG	8	ND	3.06
BENZO(A)PYRENE	UG/KG	8	ND	ND
BENZO(B)FLUORANTHENE	UG/KG	8	3.66	3.58
BENZO(GHI)PERYLENE	UG/KG	8	ND	ND
BENZO(K)FLUORANTHENE	UG/KG	8	ND	ND
CHRYSENE	UG/KG	8	ND	ND
DIBENZ(A,H)ANTHRACENE	UG/KG	8	ND	ND
FLUORANTHENE	UG/KG	8	3.4	**6.48 ***
FLUORENE	UG/KG	8	ND	ND
INDENO(1,2,3-CD)PYRENE	UG/KG	8	ND	ND
NAPHTHALENE	UG/KG	8	3.5	ND
PHENANTHRENE	UG/KG	8	ND	3.36
PYRENE	UG/KG	8	3.62	**11.1 ***
TOTAL PAHS (ND=RL)	UG/KG	--	138	137

PAHs were not tested for PNS02-03, PNS02-04, and PNS02-05 based on the results of the sediment chemistry analyses.

NOTE: Shaded and bold values indicate sites where mean tissue residues are significantly higher than the mean reference tissue ($p<0.05$).

RL = average reporting limit

ND = not detected in any of the five tested tissue replicates

TABLE 5-7 NAVAL STATION PENSACOLA TURNING BASIN: MEAN PCBs CONCENTRATIONS (UG/KG) IN *Nereis virens* (SAND WORM)

ANALYTE	UNITS	RL	PNSREF02	PNS02-02
BZ# 8*	UG/KG	2	1.56	2.06
BZ# 18*	UG/KG	2	1.08	ND
BZ# 28*	UG/KG	2	ND	ND
BZ# 44*	UG/KG	2	ND	ND
BZ# 49	UG/KG	2	ND	ND
BZ# 52*	UG/KG	2	ND	ND
BZ# 66*	UG/KG	2	ND	ND
BZ# 77*	UG/KG	2	0.992	1.02
BZ# 87	UG/KG	2	ND	ND
BZ# 101*	UG/KG	2	ND	ND
BZ# 105*	UG/KG	2	ND	ND
BZ# 118*	UG/KG	2	ND	ND
BZ# 126*	UG/KG	2	ND	ND
BZ# 128*	UG/KG	2	ND	ND
BZ# 138*	UG/KG	2	0.954	0.936
BZ# 153*	UG/KG	2	1.16	1.04
BZ# 156	UG/KG	2	ND	ND
BZ# 169*	UG/KG	2	ND	ND
BZ# 170*	UG/KG	2	ND	ND
BZ# 180*	UG/KG	2	0.96	ND
BZ# 183	UG/KG	2	ND	ND
BZ# 184	UG/KG	2	ND	ND
BZ# 187*	UG/KG	2	ND	ND
BZ# 195	UG/KG	2	ND	ND
BZ# 206	UG/KG	2	ND	ND
BZ# 209	UG/KG	2	ND	ND
TOTAL PCBS (ND=RL)	UG/KG	--	66.6	67.7

PCB congeners were not tested for PNS02-03, PNS02-04, and PNS02-05 based on the results of the sediment chemistry analyses.

* PCB congeners used for Total PCB summation, as per Table 9-3 of the ITM (USEPA/USACE 1998)

**NOTE: Shaded and bold values indicate sites where mean tissue residues are significantly higher than the mean reference tissue ($p<0.05$).

RL = average reporting limit

ND = not detected in any of the five tested tissue replicates

TABLE 5-8 NAVAL STATION PENSACOLA TURNING BASIN: MEAN PCBs CONCENTRATIONS (MG/KG) IN *Macoma nasuta* (BLUNT-NOSE CLAM)

ANALYTE	UNITS	RL	PNSREF02	PNS02-02
BZ# 8*	UG/KG	2	2.04	3.38
BZ# 18*	UG/KG	2	1.09	1.02
BZ# 28*	UG/KG	2	ND	ND
BZ# 44*	UG/KG	2	ND	ND
BZ# 49	UG/KG	2	ND	1.04
BZ# 52*	UG/KG	2	ND	ND
BZ# 66*	UG/KG	2	ND	ND
BZ# 77*	UG/KG	2	ND	ND
BZ# 87	UG/KG	2	ND	ND
BZ# 101*	UG/KG	2	ND	ND
BZ# 105*	UG/KG	2	ND	ND
BZ# 118*	UG/KG	2	ND	ND
BZ# 126*	UG/KG	2	ND	ND
BZ# 128*	UG/KG	2	ND	ND
BZ# 138*	UG/KG	2	ND	0.988
BZ# 153*	UG/KG	2	ND	0.974
BZ# 156	UG/KG	2	ND	ND
BZ# 169*	UG/KG	2	ND	ND
BZ# 170*	UG/KG	2	ND	ND
BZ# 180*	UG/KG	2	ND	ND
BZ# 183	UG/KG	2	ND	ND
BZ# 184	UG/KG	2	ND	ND
BZ# 187*	UG/KG	2	ND	ND
BZ# 195	UG/KG	2	ND	ND
BZ# 206	UG/KG	2	ND	ND
BZ# 209	UG/KG	2	ND	ND
TOTAL PCBS (ND=RL)	UG/KG	--	70.7	73.5

PCB congeners were not tested for PNS02-03, PNS02-04, and PNS02-05 based on the results of the sediment chemistry analyses.

* PCB congeners used for Total PCB summation, as per Table 9-3 of the ITM (USEPA/USACE 1998)

**NOTE: Shaded and bold values indicate sites where mean tissue residues are significantly higher than the mean reference tissue ($p<0.05$).

RL = average reporting limit

ND = not detected in any of the five tested tissue replicates

TABLE 5-9. COMPARISON OF UPPER 95% CONFIDENCE LEVELS OF THE MEAN CONCENTRATION TO USEPA TOLERANCE/GUIDANCE LEVELS[a] FOR *Nereis virens* (SAND WORM)

ANALYTE [b]	USEPA GUIDANCE LEVEL	UNITS	PNSREF02	PNS02-02	PNS02-05
ARSENIC	86	MG/KG	2.90	2.77	3.55
CADMIUM	4	MG/KG	0.07	0.07	0.07
CHROMIUM	13	MG/KG	0.30	0.20	0.22
LEAD	1.7	MG/KG	0.39	0.36	0.30
METHYL MERCURY	1	MG/KG	0.04	0.03	0.05
NICKEL	80	MG/KG	0.24	0.24	0.24
TOTAL PCB (ND=0)	2000	UG/KG	10.45	8.86	NT
TOTAL PCB (ND=1/2DL)	2000	UG/KG	22.60	21.74	NT
ALDRIN+DIELDRIN	300	UG/KG	0.67	NT	NT
CHLORDANE	300	UG/KG	4.15	NT	NT
DDT+DDD+DDE	5000	UG/KG	0.42	NT	NT
MIREX	100	UG/KG	0.60	NT	NT
TOTAL HEPTACHLOR	300	UG/KG	0.44	NT	NT

(a) primary reference for all values: (USFDA 1998) *Fish and Fishery Products Hazards and Control Guide.* U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition. January.

(b) Values provided only for chemical constituents tested and relevant to this project.

NT = not tested

TABLE 5-10. COMPARISON OF UPPER 95% CONFIDENCE LEVELS OF THE MEAN CONCENTRATION TO USEPA TOLERANCE/GUIDANCE LEVELS[a] FOR *Macoma nasuta* (BLUNT-NOSE CLAM)

ANALYTE [b]	USEPA GUIDANCE LEVEL	UNITS	PNSREF02	PNS02-02	PNS02-05
ARSENIC	86	MG/KG	4.09	4.22	4.17
CADMIUM	4	MG/KG	0.07	0.07	0.07
CHROMIUM	13	MG/KG	0.38	0.34	0.29
LEAD	1.7	MG/KG	0.77	0.69	0.52
METHYL MERCURY	1	MG/KG	0.05	0.04	0.03
NICKEL	80	MG/KG	0.63	0.66	0.61
TOTAL PCB (ND=0)	2000	UG/KG	6.91	9.74	NT
TOTAL PCB (ND=1/2DL)	2000	UG/KG	20.54	24.04	NT
ALDRIN+DIELDRIN	300	UG/KG	0.67	NT	NT
CHLORDANE	300	UG/KG	4.15	NT	NT
DDT+DDD+DDE	5000	UG/KG	0.21	NT	NT
MIREX	100	UG/KG	0.60	NT	NT
TOTAL HEPTACHLOR	300	UG/KG	0.44	NT	NT

(a) primary reference for all values: (USFDA 1998) *Fish and Fishery Products Hazards and Control Guide.* U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition. January.

(b) Values provided only for chemical constituents tested and relevant to this project.

NT = not tested

ATTACHMENT I

PREDICTED METAL CONCENTRATIONS

Pensacola Naval Station - Predicted Metal Concentrations

Aluminum	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
1	1	0.1	3	1.6	0.25	2	0.7
100	2	0.15	5	2.5	0.5	3	1.5
1000	7	0.3	20	7	2.8	7	7
10000	30	0.5	60	20	15	18	35
100000	100	0.9	200	60	70	40	180
Intercept	7.048995229	0.238652528	16.19775083	6.041938585	2.614030162	6.337709837	5.899871527
Slope	0.000942881	6.81126E-06	0.001863271	0.000548063	0.00067938	0.000344834	0.001752465

Predicted Metal Concentrations

Sample ID	Aluminum	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
PNSREF02	**9,550**	16.1	0.3	34.0	11.3	9.1	9.6	22.6
PNS02-02	**10,300**	16.8	0.3	35.4	11.7	9.6	9.9	24.0
PNS02-05	**6,770**	13.4	0.3	28.8	9.8	7.2	8.7	17.8

Actual Metal Concentrations

	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
PNSREF02	8.4	0.16 U	22.7	6.6	13.6	6.2	34.8
PNS02-02	12.7	0.17 U	32.3	18.9	130	8.6	120
PNS02-05	7.6	0.18 U	19.3	7.9	11.7	6.3	25.3

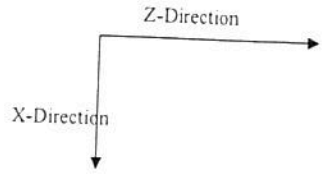
exceeds predicted limits

ATTACHMENT II

STFATE SUMMARY
PNS02-02

PENSACOLA NAVAL STATION PNS02-02

Point	Latitude DMS			Longitude DMS			State Plain? X	State Plain? Z
A							6000	6375
B							6000	27375
C							16500	6375
D							16500	27375



	Grid			Disposal Site					
				Upper Left Corner		Lower Right Corner		Disposal Location	
	Length (feet)	Grid Cells	Cell Size	Grid Cells	feet	Grid Cells	feet	Grid Cells	feet
X (top to bottom)	22,500	45	500	12	6,000	33	16500	22.5	11,250
Z (Left to right)	33,750	45	750	8.5	6,375	36.5	27375	22.5	16,875

PENSACOLA NAVAL STATION PNS02-02

INPUT PARAMETER	UNITS	VALUE
SITE DESCRIPTION		
Number of grid points (L-R, +z dir)		45
Number of grid points (T-B, +x dir)		45
Grid spacing (Left to Right) Z-Axis	ft	750
Grid spacing (Top to Bottom) X-Axis	ft	500
Constant water depth	ft	76
Bottom roughness	ft	0.005
Bottom slope (x-dir)	deg	0
Bottom slope (z-dir)	deg	0
Number of points in density profile		4
1 ft	g/cc	1.0239
25	g/cc	1.0242
50		1.0544
76		1.0247
AMBIENT VELOCITY		
Type of velocity profile		2-point at constant depth
Depth ft	Velocity X (fps)	Velocity Z (fps)
30	0	-0.720
56	0	-0.525
DISPOSAL OPERATION		
Disposal point top of grid (X-Axis)	ft	15,400
Disposal point left edge of grid (Z-Axis)	ft	7,700
Dumpint Over Depression		No
Bottom depression length x-direction	ft	0
Bottom depression length z-direction	ft	0
Bottom depression average depth	ft	0
Location of Disposal Site		
Upper Left Corner Distance from Top Edge (X)	ft	6,000
Uper Left Corner Distance from Left Edge (Z)	ft	6,375
Lower Right Corner Distance from Top Edge (X)	ft	16,500
Lower Right Corner Distance from Left Edge (Z)	ft	27,375
Length of vessel bin	ft	330
Width of vessel bin	ft	50
Distance Between Bins	ft	5
Predisposal draft	ft	20
Postdisposal draft	ft	10
Time to empty vessel	s	90
Number of Bins that Open Simultaneously	s	1
Number of Discrete Openings of Sets of Bins	s	1
Vessel velocity in x-direction	ft/s	1.7
Vessel velocity in z-direction	ft/s	0
Number of layers		1
Volume of each layer	yd^3	2,000

PENSACOLA NAVAL STATION PNS02-02

COEFFICIENTS

Settling coef (BETA)		0
Apparent mass coefficient (CM)		1
Drag coefficient (CD)		0.5
Form drag collapse cloud (CDRAG)		1
Skin friction collapse cloud (CFRIC)		0.01
Drag ellipse wedge (CD3)		0.1
Drag plate (CD4)		1
Friction between cloud and bottom (FRICTN)		0.01
4/3 Law horizontal diffusion coefficient (ALAMDA)		0.001
Unstratified vertical diffusion coefficient (AKY0)		0.025
Cloud/ambient density gradient ratio (GAMA)		0.25
Turbulent thermal entrainment (ALPHA0)		0.235
Entrainment collapse (ALPHAC)		0.1
Stripping factor (CSTRIP)		0.003

INPUT, EXECUTION & OUTPUT KEYS

Process to simulate		Disp. from Split-Hull Barge/Scow
Duration of simulation	s	14,400
Long Term Time Step	s	600
Convective descent output		
Collapse phase output option		
Number of print times for diffusion		
Number of depths for output		4
Depths for output	ft	0,25,50,75

Water Quality - Tier II

Contaminant		Ammonia
Acute Water Quality Criteria at Edge of Mixing Zone	mg/L	9.42
Chronic Water Quality Criteria at Edge of Mixing Zone	mg/L	1.41
Predicted initial concentration in fluid	mg/L	2.5
Background concentration	mg/L	0

Toxicity - Tier III

EC50	% Elutriate	100
0.01 EC50	% Elutriate	1

PENSACOLA NAVAL STATION PNS02-02

MATERIAL DESCRIPTION

	Specific Gravity	Solids Vol. Fraction	Settling Velocity (fps)	Void Ratio	Crit. Shear Stress (lbs/ft^2)	Cohesive	Stripped During Descent
Sand	2.7000	0.1761	0.1000	0.6000	0.0250	N	Y
Silt	2.6500	0.0829	0.0100	3.0000	0.0100	Y	Y
Clay	2.6500	0.0788	0.0020	5.0000	0.0020	Y	Y

Dredge site water density (g/cc)	1.0000

Convert from Fraction by Weight (ASTM) to Fraction by Total Volume used by STFATE

Fluid fraction

Percent Solids by Weight	Bulk Density (g/cc)
0.353	2.56

	%Grain Size Distribution by Weight	density g/cc	g Solidi/cc	Vol Fraction (cc Solid i/cc Sediment)
gravel		2.70	0.00E+00	0.0000
sand	0.5260	2.70	4.75E-01	0.1761
silt	0.2430	2.65	2.20E-01	0.0829
clay	0.2310	2.65	2.09E-01	0.0788
	1.00	Total Solids Volume:	9.04E-01	

Specify

f_{solids} = solids fraction by weight, $\frac{\text{g-solids}}{\text{g-bulk}}$

f_{s_i} = grain size fraction by weight, $\frac{\text{g-fraction i}}{\text{g-solids}}$

ρ_{blk} = bulk sediment density, $\frac{\text{g-sediment}}{\text{cm}^3}$

ρ_i = density of sediemnt fraction i, $\frac{\text{g-solid i}}{\text{cm}^3}$

Calculate

W_i = weight concentration of sediment fraction i, $\frac{\text{g-solid i}}{\text{cm}^3}$

$\forall_i$ = volume concentration of sediment fraction i, $\frac{\text{cm}^3\text{-solid i}}{\text{cm}^3}$

$$W_i = \rho_{blk} \times f_{solids} \times f_{s_i}$$

$$\forall_i = \frac{W_i}{\rho_i}$$

PENSACOLA NAVAL STATION PNS02-02

elutriate	2.5 mg/L	Required Dilution	
acute criteria	9.42 mg/L	0	
chronic criteria	1.41 mg/L	2	

Disposal Location	coord_ft
X ft	11,250
Z ft	16,875

TIME (HR)	DEPTH (FT)	MAX CONC ABOVE BACKGROUND ON ENTIRE GRID (MG/L)	MAX CONC ON GRID (MG/L)	X-LOC (FT)	Z-LOC (FT)	MAX CONC ABOVE BACKGROUND OUTSIDE DISPOSAL SITE (MG/L)	MAX CONC OUTSIDE SITE (MG/L)	DF	DISTANCE
0.17	59.2	1.13E-07	1.13E-07	11500	16500	0.00E+00	0.00E+00	22,123,894	451
0.33	59.2	8.01E-03	8.01E-03	11500	16500	0.00E+00	0.00E+00	312	451
0.5	59.2	7.10E-02	7.10E-02	11500	16500	0.00E+00	0.00E+00	35	451
0.67	59.2	1.93E-02	1.93E-02	11500	16500	0.00E+00	0.00E+00	130	451
0.83	59.2	1.49E-03	1.49E-03	11500	16500	0.00E+00	0.00E+00	1,678	451
1	59.2	1.23E-02	1.23E-02	11500	15750	0.00E+00	0.00E+00	**203**	**1,152**
1.17	59.2	2.67E-02	2.67E-02	11500	15750	0.00E+00	0.00E+00	94	1,152
1.33	59.2	1.54E-02	1.54E-02	11500	15750	0.00E+00	0.00E+00	162	1,152
1.5	59.2	4.50E-03	4.50E-03	11500	15750	0.00E+00	0.00E+00	556	1,152
1.67	59.2	1.03E-02	1.03E-02	11500	15000	0.00E+00	0.00E+00	243	1,892
1.83	59.2	1.16E-02	1.16E-02	11500	15000	0.00E+00	0.00E+00	216	1,892
2	59.2	7.17E-03	7.17E-03	11500	15000	0.00E+00	0.00E+00	349	1,892
2.17	59.2	4.86E-03	4.86E-03	11500	14250	0.00E+00	0.00E+00	514	2,637
2.33	59.2	6.51E-03	6.51E-03	11500	14250	0.00E+00	0.00E+00	384	2,637
2.5	59.2	5.42E-03	5.42E-03	11500	14250	0.00E+00	0.00E+00	461	2,637
2.67	59.2	3.28E-03	3.28E-03	11500	14250	0.00E+00	0.00E+00	762	2,637
2.83	59.2	3.89E-03	3.89E-03	11500	13500	0.00E+00	0.00E+00	643	3,384
3	59.2	3.59E-03	3.59E-03	11500	13500	0.00E+00	0.00E+00	696	3,384
3.17	59.2	2.57E-03	2.57E-03	11500	13500	0.00E+00	0.00E+00	973	3,384
3.33	59.2	2.55E-03	2.55E-03	11500	12750	0.00E+00	0.00E+00	980	4,133
3.5	59.2	2.40E-03	2.40E-03	11500	12750	0.00E+00	0.00E+00	1,042	4,133
3.67	59.2	1.84E-03	1.84E-03	11500	12750	0.00E+00	0.00E+00	1,359	4,133
3.83	59.2	1.78E-03	1.78E-03	11500	12000	0.00E+00	0.00E+00	1,404	4,881
4	59.2	1.66E-03	1.66E-03	11500	12000	0.00E+00	0.00E+00	**1,506**	**4,881**

PENSACOLA NAVAL STATION PNS02-02

EC50	100	% Elutriate
.01 EC50	1	fraction
DF FOR 1% EC50	100.00	Dilution Required

Disposal Location	coord_ft
X ft	11,250
Z ft	16,875

TIME (HR)	DEPTH (FT)	MAX CONC ABOVE BACKGROUND ON ENTIRE GRID (PERCENT)	X-LOC (FT)	Z-LOC (FT)	MAX CONC ABOVE BACKGROUND OUTSIDE DISPOSAL SITE (PERCENT)	DF	DISTANCE
0.17	59.2	4.53E-06	11500	16500	0.00E+00	22,075,055	451
0.33	59.2	3.21E-01	11500	16500	0.00E+00	312	451
0.5	59.2	2.84E+00	11500	16500	0.00E+00	35	451
0.67	59.2	7.71E-01	11500	16500	0.00E+00	130	451
0.83	59.2	5.97E-02	11500	16500	0.00E+00	1,675	451
1	**59.2**	**4.92E-01**	**11500**	**15750**	**0.00E+00**	**203**	**1,152**
1.17	59.2	1.07E+00	11500	15750	0.00E+00	93	1,152
1.33	59.2	6.17E-01	11500	15750	0.00E+00	162	1,152
1.5	59.2	1.80E-01	11500	15750	0.00E+00	556	1,152
1.67	59.2	4.11E-01	11500	15000	0.00E+00	243	1,892
1.83	59.2	4.65E-01	11500	15000	0.00E+00	215	1,892
2	59.2	2.87E-01	11500	15000	0.00E+00	348	1,892
2.17	59.2	1.94E-01	11500	14250	0.00E+00	515	2,637
2.33	59.2	2.60E-01	11500	14250	0.00E+00	385	2,637
2.5	59.2	2.17E-01	11500	14250	0.00E+00	461	2,637
2.67	59.2	1.31E-01	11500	14250	0.00E+00	763	2,637
2.83	59.2	1.56E-01	11500	13500	0.00E+00	641	3,384
3	59.2	1.44E-01	11500	13500	0.00E+00	694	3,384
3.17	59.2	1.03E-01	11500	13500	0.00E+00	971	3,384
3.33	59.2	1.02E-01	11500	12750	0.00E+00	980	4,133
3.5	59.2	9.61E-02	11500	12750	0.00E+00	1,041	4,133
3.67	59.2	7.38E-02	11500	12750	0.00E+00	1,355	4,133
3.83	59.2	7.14E-02	11500	12000	0.00E+00	1,401	4,881
4	**59.2**	**6.62E-02**	**11500**	**12000**	**0.00E+00**	**1,511**	**4,881**

6.62% lowest EC50 that will comply

PENSACOLA NAVAL STATION PNS02-02

Summary of STFATE Modeling for Pensacola Naval Station - 10 May 2007.

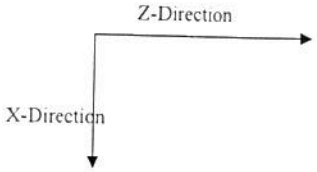
	1-hr		4-hrs			
Placement Volume (cuy)	Dilution Factor	Feet Traveled	Dilution Factor	Feet Traveled	Aqute WQ Violation	EC50 Violation
2000	203	1,152	1,511	4,881	No	No

ATTACHMENT III

STFATE SUMMARY
PNS02-05

PENSACOLA NAVAL STATION PNS02-05

						State Plain?	
Point	Latitude DMS			Longitude DMS		X	Z
A						6000	6375
B						6000	27375
C						16500	6375
D						16500	27375



				Disposal Site					
	Grid			Upper Left Corner		Lower Right Corner		Disposal Location	
	Length (feet)	Grid Cells	Cell Size	Grid Cells	feet	Grid Cells	feet	Grid Cells	feet
X (top to bottom)	22,500	45	500	12	6,000	33	16500	22.5	11,250
Z (Left to right)	33,750	45	750	8.5	6,375	36.5	27375	22.5	16,875

PENSACOLA NAVAL STATION PNS02-05

INPUT PARAMETER	UNITS	VALUE
SITE DESCRIPTION		
Number of grid points (L-R, +z dir)		45
Number of grid points (T-B, +x dir)		45
Grid spacing (Left to Right) Z-Axis	ft	750
Grid spacing (Top to Bottom) X-Axis	ft	500
Constant water depth	ft	76
Bottom roughness	ft	0.005
Bottom slope (x-dir)	deg	0
Bottom slope (z-dir)	deg	0
Number of points in density profile		4
1 ft	g/cc	1.0239
25	g/cc	1.0242
50		1.0544
76		1.0247
AMBIENT VELOCITY		
Type of velocity profile		2-point at constant depth
Depth ft	Velocity X (fps)	Velocity Z (fps)
30	0	-0.720
56	0	-0.525
DISPOSAL OPERATION		
Disposal point top of grid (X-Axis)	ft	15,400
Disposal point left edge of grid (Z-Axis)	ft	7,700
Dumpint Over Depression		No
Bottom depression length x-direction	ft	0
Bottom depression length z-direction	ft	0
Bottom depression average depth	ft	0
Location of Disposal Site		
Upper Left Corner Distance from Top Edge (X)	ft	6,000
Uper Left Corner Distance from Left Edge (Z)	ft	6,375
Lower Right Corner Distance from Top Edge (X)	ft	16,500
Lower Right Corner Distance from Left Edge (Z)	ft	27,375
Length of vessel bin	ft	330
Width of vessel bin	ft	50
Distance Between Bins	ft	5
Predisposal draft	ft	20
Postdisposal draft	ft	10
Time to empty vessel	s	90
Number of Bins that Open Simultaneously	s	1
Number of Discrete Openings of Sets of Bins	s	1
Vessel velocity in x-direction	ft/s	1.7
Vessel velocity in z-direction	ft/s	0
Number of layers		1
Volume of each layer	yd^3	2,000

PENSACOLA NAVAL STATION PNS02-05

COEFFICIENTS

Settling coef (BETA)		0
Apparent mass coefficient (CM)		1
Drag coefficient (CD)		0.5
Form drag collapse cloud (CDRAG)		1
Skin friction collapse cloud (CFRIC)		0.01
Drag ellipse wedge (CD3)		0.1
Drag plate (CD4)		1
Friction between cloud and bottom (FRICTN)		0.01
4/3 Law horizontal diffusion coefficient (ALAMDA)		0.001
Unstratified vertical diffusion coefficient (AKY0)		0.025
Cloud/ambient density gradient ratio (GAMA)		0.25
Turbulent thermal entrainment (ALPHA0)		0.235
Entrainment collapse (ALPHAC)		0.1
Stripping factor (CSTRIP)		0.003

INPUT, EXECUTION & OUTPUT KEYS

Process to simulate		Disp. from Split-Hull Barge/Scow
Duration of simulation	s	14,400
Long Term Time Step	s	600
Convective descent output		
Collapse phase output option		
Number of print times for diffusion		
Number of depths for output		4
Depths for output	ft	0,25,50,75

Water Quality - Tier II

Contaminant		Ammonia
Acute Water Quality Criteria at Edge of Mixing Zone	mg/L	9.42
Chronic Water Quality Criteria at Edge of Mixing Zone	mg/L	1.41
Predicted initial concentration in fluid	mg/L	1.2
Background concentration	mg/L	0

Toxicity - Tier III

EC50	% Elutriate	100
0.01 EC50	% Elutriate	1

PENSACOLA NAVAL STATION PNS02-05

MATERIAL DESCRIPTION

	Specific Gravity	Solids Vol. Fraction	Settling Velocity (fps)	Void Ratio	Crit. Shear Stress (lbs/ft^2)	Cohesive	Stripped During Descent
Sand	2.7000	0.5187	0.1000	0.6000	0.0250	N	Y
Silt	2.6500	0.0198	0.0100	3.0000	0.0100	Y	Y
Clay	2.6500	0.0516	0.0020	5.0000	0.0020	Y	Y

Dredge site water density (g/cc)	1.0000

Convert from Fraction by Weight (ASTM) to Fraction by Total Volume used by STFATE

Fluid fraction

Percent Solids by Weight	Bulk Density (g/cc)
0.621	2.56

	%Grain Size Distribution by Weight	density g/cc	g Solidi/cc	Vol Fraction (cc Solid i/cc Sediment)
gravel		2.70	0.00E+00	0.0000
sand	0.8810	2.70	1.40E+00	0.5187
silt	0.0330	2.65	5.25E-02	0.0198
clay	0.0860	2.65	1.37E-01	0.0516
	1.00	Total Solids Volume:	1.59E+00	

Specify

f_{solids} = solids fraction by weight, $\frac{\text{g-solids}}{\text{g-bulk}}$

f_{s_i} = grain size fraction by weight, $\frac{\text{g-fraction i}}{\text{g-solids}}$

ρ_{blk} = bulk sediment density, $\frac{\text{g-sediment}}{\text{cm}^3}$

ρ_i = density of sediemnt fraction i, $\frac{\text{g-solid i}}{\text{cm}^3}$

Calculate

W_i = weight concentration of sediment fraction i, $\frac{\text{g-solid i}}{\text{cm}^3}$

$\forall_i$ = volume concentration of sediment fraction i, $\frac{\text{cm}^3\text{-solid i}}{\text{cm}^3}$

$$W_i = \rho_{blk} \times f_{solids} \times f_{s_i}$$

$$\forall_i = \frac{W_i}{\rho_i}$$

PENSACOLA NAVAL STATION PNS02-05

elutriate	1.2 mg/L	Required Dilution	
acute criteria	9.42 mg/L		0
chronic criteria	1.41 mg/L		1

Disposal Location	coord_ft
X ft	11,250
Z ft	16,875

TIME (HR)	DEPTH (FT)	MAX CONC ABOVE BACKGROUND ON ENTIRE GRID (MG/L)	MAX CONC ON GRID (MG/L)	X-LOC (FT)	Z-LOC (FT)	MAX CONC ABOVE BACKGROUND OUTSIDE DISPOSAL SITE (MG/L)	MAX CONC OUTSIDE SITE (MG/L)	DF	DISTANCE
0.17	59.1	6.12E-08	6.12E-08	11500	16500	0.00E+00	0.00E+00	19,607,843	451
0.33	59.1	2.49E-03	2.49E-03	11500	16500	0.00E+00	0.00E+00	482	451
0.5	59.1	2.02E-02	2.02E-02	11500	16500	0.00E+00	0.00E+00	59	451
0.67	59.1	5.71E-03	5.71E-03	11500	16500	0.00E+00	0.00E+00	210	451
0.83	59.1	4.72E-04	4.72E-04	11500	16500	0.00E+00	0.00E+00	2,542	451
1	59.1	3.72E-03	3.72E-03	11500	15750	0.00E+00	0.00E+00	**323**	**1,152**
1.17	59.1	7.68E-03	7.68E-03	11500	15750	0.00E+00	0.00E+00	156	1,152
1.33	59.1	4.39E-03	4.39E-03	11500	15750	0.00E+00	0.00E+00	273	1,152
1.5	59.1	1.29E-03	1.29E-03	11500	15750	0.00E+00	0.00E+00	930	1,152
1.67	59.1	3.04E-03	3.04E-03	11500	15000	0.00E+00	0.00E+00	395	1,892
1.83	59.1	3.35E-03	3.35E-03	11500	15000	0.00E+00	0.00E+00	358	1,892
2	59.1	2.04E-03	2.04E-03	11500	15000	0.00E+00	0.00E+00	588	1,892
2.17	59.1	1.46E-03	1.46E-03	11500	14250	0.00E+00	0.00E+00	822	2,637
2.33	59.1	1.90E-03	1.90E-03	11500	14250	0.00E+00	0.00E+00	632	2,637
2.5	59.1	1.55E-03	1.55E-03	11500	14250	0.00E+00	0.00E+00	774	2,637
2.67	59.1	9.32E-04	9.32E-04	11500	14250	0.00E+00	0.00E+00	1,288	2,637
2.83	59.1	1.14E-03	1.14E-03	11500	13500	0.00E+00	0.00E+00	1,053	3,384
3	59.1	1.04E-03	1.04E-03	11500	13500	0.00E+00	0.00E+00	1,154	3,384
3.17	59.1	7.33E-04	7.33E-04	11500	13500	0.00E+00	0.00E+00	1,637	3,384
3.33	59.1	7.52E-04	7.52E-04	11500	12750	0.00E+00	0.00E+00	1,596	4,133
3.5	59.1	6.97E-04	6.97E-04	11500	12750	0.00E+00	0.00E+00	1,722	4,133
3.67	59.1	5.30E-04	5.30E-04	11500	12750	0.00E+00	0.00E+00	2,264	4,133
3.83	59.1	5.26E-04	5.26E-04	11500	12000	0.00E+00	0.00E+00	2,281	4,881
4	59.1	4.81E-04	4.81E-04	11500	12000	0.00E+00	0.00E+00	**2,495**	**4,881**

PENSACOLA NAVAL STATION PNS02-05

EC50	100	% Elutriate
.01 EC50	1	fraction
DF FOR 1% EC50	100.00	Dilution Required

Disposal Location	coord_ft
X ft	11,250
Z ft	16,875

TIME (HR)	DEPTH (FT)	MAX CONC ABOVE BACKGROUND ON ENTIRE GRID (PERCENT)	X-LOC (FT)	Z-LOC (FT)	MAX CONC ABOVE BACKGROUND OUTSIDE DISPOSAL SITE (PERCENT)	DF	DISTANCE
0.17	59.1	5.10E-06	11500	16500	0.00E+00	19,607,843	451
0.33	59.1	2.07E-01	11500	16500	0.00E+00	483	451
0.5	59.1	1.68E+00	11500	16500	0.00E+00	60	451
0.67	59.1	4.76E-01	11500	16500	0.00E+00	210	451
0.83	59.1	3.93E-02	11500	16500	0.00E+00	2,545	451
1	**59.1**	**3.10E-01**	**11500**	**15750**	**0.00E+00**	**323**	**1,152**
1.17	59.1	6.40E-01	11500	15750	0.00E+00	156	1,152
1.33	59.1	3.66E-01	11500	15750	0.00E+00	273	1,152
1.5	59.1	1.08E-01	11500	15750	0.00E+00	926	1,152
1.67	59.1	2.54E-01	11500	15000	0.00E+00	394	1,892
1.83	59.1	2.79E-01	11500	15000	0.00E+00	358	1,892
2	59.1	1.70E-01	11500	15000	0.00E+00	588	1,892
2.17	59.1	1.22E-01	11500	14250	0.00E+00	820	2,637
2.33	59.1	1.58E-01	11500	14250	0.00E+00	633	2,637
2.5	59.1	1.30E-01	11500	14250	0.00E+00	769	2,637
2.67	59.1	7.77E-02	11500	14250	0.00E+00	1,287	2,637
2.83	59.1	9.54E-02	11500	13500	0.00E+00	1,048	3,384
3	59.1	8.66E-02	11500	13500	0.00E+00	1,155	3,384
3.17	59.1	6.11E-02	11500	13500	0.00E+00	1,637	3,384
3.33	59.1	6.26E-02	11500	12750	0.00E+00	1,597	4,133
3.5	59.1	5.81E-02	11500	12750	0.00E+00	1,721	4,133
3.67	59.1	4.41E-02	11500	12750	0.00E+00	2,268	4,133
3.83	59.1	4.38E-02	11500	12000	0.00E+00	2,283	4,881
4	**59.1**	**4.01E-02**	**11500**	**12000**	**0.00E+00**	**2,494**	**4,881**

4.01% lowest EC50 that will comply

PENSACOLA NAVAL STATION PNS02-05

Summary of STFATE Modeling for Pensacola Naval Station - 10 May 2007.

	1-hr		4-hrs			
Placement Volume (cuy)	Dilution Factor	Feet Traveled	Dilution Factor	Feet Traveled	Aqute WQ Violation	EC50 Violation
2000	323	1,152	2,494	4,881	No	No

CESAM-PD-M

15 May 2007

MEMORANDUM FOR District Engineer

SUBJECT: Environmental Impact Statement (EIS) for Base Realignment and Closure (BRAC) Realignment at Pinon Canyon Maneuver Site (PCMS), Colorado – FOR DECISION

1. PURPOSE. Provide an EIS for the BRAC realignment at PCMS, Colorado.

2. REFERENCE. PCMS EIS (Tab A).

3. RECOMMENDATION. That the District Engineer approve the PCMS EIS by signing the signature sheet at Tab A.

APPROVED_____ SEE ME_____ OTHER_____

4. BACKGROUND AND DISCUSSION.

a. The PCMS EIS has undergone two formal rounds of Army review by representatives of BRAC-Division, Assistant Chief of Staff for Installation Management, Installation Management Agency, Fort Carson personnel, and Environmental Law Division. Additionally, the Mobile District BRAC NEPA Support Team has reviewed the EIS. All relevant recommended changes have been incorporated into the document.

b. The above reviewers approved this document for final printing and distribution. Mr. David Brasfield, CESAM-OC reviewed and commented on the PCMS EIS.

c. We need the signed signature page for the EIS delivered to Fort Carson for their action by 16 May 2007. This will ensure the PCMS EIS is signed by the Fort Carson garrison commander and completed ahead of schedule.

d. There was a controversial environmental issue associated with implementing the BRAC realignment recommendations at PCMS. This issue is based on the relationship between transformation and the potential future expansion of the PCMS. The Army recognizes that this issue regarding the potential future expansion of the PCMS is of considerable public interest. Subsequent to the release of the PCMS Transformation Draft EIS, the Department of Defense approved a waiver request to allow the Army to begin the potential future expansion process for land in the vicinity of the PCMS. Analysis of the potential future expansion of the PCMS has not progressed to the point of being ready for NEPA analysis at this time.

5. IMPACTS. Approval of the document will allow PCMS to maintain the schedule they have set for implementing the BRAC-related construction. Delay of approval will adversely impact this schedule and will result in additional costs to our customer.

6. MOBILE DISTRICT POC. Mr. Brian Peck, 690-2750.

7. COORDINATION.

CESAM-OC Concur/Nonconcur _____

Encl

CURTIS M.FLAKES

Chief, Planning and Environmental Division

Action Officer, Neil D. Robison (251) 690-3018